



# Imperial Bureau of Plant Breeding and Genetics

## Plant Breeding Abstracts

Vol. X, No. 3.

(Abstracts Nos 584—920)

School of Agriculture  
Cambridge  
England

1st July, 1940.

# TABLE OF CONTENTS.

		PAGE
519	Statistics* .. .. .	180
575	Breeding* (Empire) .. .. .	159
	(Foreign) .. .. .	181
575.1	Genetics* (Empire) .. .. .	159
	(Foreign) .. .. .	184
576.1	Origin of Species, etc. (Empire) .. .. .	159
	(Foreign) .. .. .	186
576.3	Cytology* .. .. .	186
58	Botany* .. .. .	189
631.531.12	Seed Production .. .. .	190
632	Plant Diseases and Pests* (Empire) .. .. .	160
	(Foreign) .. .. .	190
633	Economic Plants (Empire) .. .. .	161
	(Foreign) .. .. .	192
633.1	Cereals (Empire) .. .. .	161
	(Foreign) .. .. .	194
633.11	Wheat (Empire) .. .. .	162
	(Foreign) .. .. .	194
633.12	Buckwheat .. .. .	200
633.13	Oats (Empire) .. .. .	165
	(Foreign) .. .. .	200
633.15	Maize .. .. .	201
633.16	Barley (Empire) .. .. .	166
	(Foreign) .. .. .	205
633.17	Millet and Sorghum .. .. .	206
633.18	Rice (Empire) .. .. .	166
	(Foreign) .. .. .	207
633.19	Other Cereals .. .. .	208
633.2	Forage Grasses .. .. .	208
633.289	Bamboo .. .. .	166
633.31/37	Leguminous Forage Plants .. .. .	209
633.4	Roots and Tubers (Empire) .. .. .	166
	(Foreign) .. .. .	210
633.5	Fibres (Empire) .. .. .	167
	(Foreign) .. .. .	212
633.6	Sugar Plants (Empire) .. .. .	172
	(Foreign) .. .. .	217
633.7	Stimulants (Empire) .. .. .	174
	(Foreign) .. .. .	218
633.8	Aromatic Plants (Empire) .. .. .	175
	(Foreign) .. .. .	230
633.85	Oil Plants (Empire) .. .. .	176
	(Foreign) .. .. .	230
633.91	Rubber Plants .. .. .	231
634	Fruit Trees (Empire) .. .. .	176
	(Foreign) .. .. .	232
634.3	Citrus Fruits .. .. .	234
634.4	Various Small Fruits .. .. .	177
634.5	Nuts .. .. .	234
634.6	Palmaceous and Other Tree Fruits (Empire) .. .. .	177
	(Foreign) .. .. .	236
634.7	Small Bush Fruits .. .. .	237
634.77	Other Fruits .. .. .	177
634.8	Viticulture .. .. .	237
634.9	Forestry (Empire) .. .. .	178
	(Foreign) .. .. .	238
635	Vegetables (Empire) .. .. .	178
	(Foreign) .. .. .	241
	Book Reviews .. .. .	248

Note.—Initialled abstracts are written by the following:—

Mr H. M. Finucan .. .. .	H. M. F.
Mr J. L. Fyfe .. .. .	J. L. F.
Mr H. O. Hartley .. .. .	H. O. H.
Dr B. P. Pal .. .. .	B. P. P.
Mr R. W. Shorrocks .. .. .	R. W. S.
Professor Dr M. Skalińska .. .. .	M. S.
Mr E. J. Williams .. .. .	E. J. W.
Dr J. Wishart .. .. .	J. W.

\* General studies, see also individual crops.

# Plant Breeding Abstracts.

## Vol. X, No. 3.

### Part 1. Empire Section

#### BREEDING 575

584. KHAN, M. A. 575:633(54.5)  
**What's doing in All-India. The Punjab.**  
Indian Fmg 1940 : 1 : 86-90.

This review of agricultural research in the Punjab includes a description of breeding work on wheat, barley, rice, cotton, sugar cane, oil seeds and *Cicer*, more detailed reports of which have been summarized in "Plant Breeding Abstracts".

585. 575:633(68)  
633.15-2.112-1.521.6:575(68)  
BALL, R. S.  
**Some South African investigations on fodder crops, field crops and animal husbandry.**  
E. Afr. Agric. J. 1940 : 5 : 380-82.

Breeding work being carried out at the School of Agriculture, Potchefstroom, is reviewed. This includes work on cowpeas, soya beans, sorghum, spineless cactus and maize. With respect to maize, the production of synthetic varieties from selected pure lines is an important feature, 14-16 such lines usually being used. No great yield increases over present-day varieties are expected but the new varieties are superior in drought resistance.

586. 575:633(71)  
**Crop varieties accessioned since January 3, 1939.**  
Cereal Div., Cent. Exp. Fm, Ottawa, Ont. 1940 : Pp. 4. (Mimeographed).

This list of crop varieties given Canadian Accession Numbers is issued periodically. The present issue, which covers the year 1939, includes varieties of wheat, rye, oats, flax, field beans and peas. The name and address of the institute applying for each accession is given. The list will be of use to breeders wishing to arrange exchanges of small quantities of seed.

#### GENETICS 575.1

587. LAWRENCE, W. J. C. and PRICE, J. R. 575.11.061.6:581.46:581.192  
**The genetics and chemistry of flower colour variation.**  
Biol. Rev. 1940 : 15 : 35-58.

An extensive review of the subject, with a valuable bibliography.

588. 575.242:576.12  
576.356:576.12  
WADDINGTON, C. H.  
**The raw materials of evolution.**  
Discovery 1939 : 2 : 283-87.

A simple exposition of the phenomena of chromosome structural rearrangement and gene mutation.

#### ORIGIN OF SPECIES, ETC. 576.1

589. MATHER, K. 576.12:577.8:581.162.52  
**Outbreeding and separation of the sexes.**  
Nature, Lond. 1940 : 145 : 484-86.

The probable reasons why different mechanisms have in general been adopted in animals and in plants to ensure cross-fertilization (unisexuality in animals, self-incompatibility and similar devices in plants) are discussed. The separation of the sexes is held to be efficient in animals because of their motility and consequent ability to select mates, while in plants unisexuality would lead to a much greater gametic wastage than bisexuality accompanied by a self-incompatibility mechanism determined by a large number of multiple allelomorphs as in *Nicotiana*, red clover, etc., where the actual gametic loss is inversely proportional to the number of the allelomorphs.

KOSTOFF, D.

633.71:581.143.32:575.127.2:576.356.2

**Studies on atypical growth in plants from a cytogenetic point of view.**

J. Genet. 1940 : 39 : 469-84.

The galls produced by various insect pests and diseases and the atypical growth produced by agents such as colchicine, acenaphthene,  $\alpha$ -brom-napthaline and 5-brom-acenaphthene are discussed and particular reference is made to the action of ethyl mercury chloride ("Grano-san", cf. "Plant Breeding Abstracts", Vol. X, Abst. 8). Atypical growths formed when seeds were germinated in desiccators containing apples are also described; the action is believed to be due to the evolution of ethylene from the fruit and the chromosome number in this case is usually unaffected.

The remainder of the paper is devoted to a study of the hereditary tumours found in certain *Nicotiana* hybrids, e.g. *N. glauca* x *N. Langsdorffii* and its amphidiploid. Evidence is presented that these tumours are conditioned by repeated somatic interchange between chromosomes, as evidenced by the appearance of chromatin bridges at mitotic anaphase (cf. "Plant Breeding Abstracts", Vol. X, Abst. 41). It is suggested that these interchanges are due to crossing-over in heterochromatic regions of non-homologous chromosomes.

591.

HOPKINS, R. H.

632.422.3:575.12

**Some recent advances in the biology of malting and brewing. The artificial hybridisation of yeasts.**

J. Inst. Brew. 1940 : 46 : 68-74.

This is an account of recent work on the hybridization of yeasts and particularly that of Winge and Laustsen. The author gives a popular account of the mechanism of segregation in yeasts which is not, however, in conformity with modern interpretations. The discussions which followed two presentations of the paper are given in full.

592.

JOHNSON, T. and

NEWTON, M.

632.452:576.16:575.11:633.13

**Crossing and selfing studies with physiologic races of oat stem rust.**

Canad. J. Res. 1940 : 18 : Sect. C : 54-67.

On selfing, some of the races of *Puccinia graminis avenae* appeared to be homozygous, with respect to the infection types produced on a series of oat varieties, and others heterozygous. The selfed progenies and also a series of crosses showed that the more virulent types behave as recessives. Differences between reciprocal crosses of the rust races were found. In crosses between races with red and orange uredospores, the normal red colour proved dominant. Changes in infection type of race 3 on the barberry were observed when the teleutospores were stored for long periods.

593.

SIMMONDS, J. H. and

632.483:576.16:575.242

MITCHELL, R. S.

634.771-2.483-1.521.6

**Black end and anthracnose of the banana with special reference to *Gloeosporium musarum* Cke. and Mass.**

Bull. Coun. Sci. Industr. Res. Aust. 1940 : No. 131 : Pp. 63.

An extensive account of the disease is given. Three strains of the fungus *G. musarum*, A, B and C, were recognized. They were almost equally pathogenic. In culture, mutations from A (the common form) to B and C and reverse mutations were observed. The Veimama variety of banana was markedly more resistant than the Cavendish.

594.

THORPE, H. C.

632.951.1:575(67.62)

**Pyrethrum breeding : a progress report.**

E. Afr. Agric. J. 1940 : 5 : 364-68.

After reviewing the evidence that pyrethrin content is heritable and varies widely from plant to plant, the breeding work in progress in Kenya is outlined. Single plant selections from commercial fields have been made for a number of years and clones with a pyrethrin content as high as 2.22-2.44% are being increased for distribution. The propagation of high pyrethrin strains by seed is not considered satisfactory, since the crop is self-sterile and seed progenies normally have a lower mean pyrethrin content than the selected mother plants.

Hybridization is being accomplished by growing the parents together at a distance from other pyrethrum plants. It is hoped that clones with exceptionally high pyrethrin content may be obtained in this way as a result of transgressive segregation, attention also being paid, of course, to other plant characters.

The induction of polyploidy by means of colchicine is being tried. It will probably lead to larger flowers and possibly to an increase in self-compatibility, but it is pointed out that any reduction in fertility due to polyploidy would probably lead to a fall in pyrethrin content, since most of the pyrethrin occurs in the developing seed.

595. GEORGI, C. D. V. and  
TEIK, G. L. 632.951.1:581.165.1:581.6:575(91)  
**Further experiments with selected plants of *Derris elliptica*,  
Changi No. 3.**  
Malay. Agric. J. 1940 : 28 : 44-68.

Trials of a number of clonal progenies derived from selected plants of the *D. elliptica* variety Changi No. 3 are reported. There is considerable fluctuation in yield and in rotenone and ether extract content within each clone, but no evidence that poor plants of any clone give rise to vegetative progeny which are below the average for that clone.

Significant differences between clones in toxin content were recorded.

Studies were made of the effect of different spacings on yield and of the effect of age of plant on toxin content.

### ECONOMIC PLANTS 633

596. GARRETT, S. D. 633-2-1.521.6:575  
**Losses to world agriculture through root disease of crops.**  
Trop. Agriculture, Trin. 1940 : 17 : 49-52.

A reprint of the article summarized in "Plant Breeding Abstracts", Vol. X, Abst. 12.

597. SANSOME, F. W. 633-2-1.521.6:575  
**Breeding disease-resistant plants.**  
Nature, Lond. 1940 : 145 : 690-93.

In this review recent work on several aspects of the problem of breeding for disease resistance is considered. The special difficulties encountered include the constant production of new physiological forms of many pathogens. The case of the potato is specially discussed and the demonstration by Reddick (cf. "Plant Breeding Abstracts", Vol. X, Abst. 169) of the increase in virulence of strains of *Phytophthora infestans* on passage through a somewhat resistant host is cited. This increase is held to be due to the fact that somatic mutation in the fungus is continually occurring. Selection in the fungus population in a susceptible host is inoperative and virulent mutants, being present in very small proportion, tend to be lost, whereas in a resistant host the virulent types have a selective advantage.

### CEREALS 633.1

598. COCHRAN, W. G. 633.1:519.271.3:631.421  
**The estimation of the yields of cereal experiments by sampling for  
the ratio of grain to total produce.**  
J. Agric. Sci. 1940 : 30 : 262-75.

In a number of cereal experiments the yields of grain and straw per plot were estimated by weighing the whole produce of the plot and taking samples, usually from the sheaves, to estimate the ratio of grain to total produce. This method proved less accurate than had been indicated by the experiments of Yates and Zaccopanay (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 674), but was substantially better than the older method of cutting small areas from the standing crop without weighing the total produce, since about one quarter of the number of samples are required to attain equal precision.

The samples were taken both by an approximately random process and by seizing a few shoots haphazardly from each of several sheaves. The latter method indicated on the whole a slightly higher yield of grain, the greatest positive bias being 6%. The time taken in sampling, however, was about one third of that required for random samples and the use of the "grab" method is recommended for the majority of samples required in any experiment. The validity of an approximate formula for calculating the variance of a ratio is discussed briefly in an appendix.

**Sixth Annual Report for the year 1938-39. Wheat Research Institute, Christchurch, New Zealand. C. Wheat-breeding.**

Bull. Dep. Sci. Industr. Res. N.Z. 1939 : No. 81 : 20-25.

Notes on the performance of the varieties Cross 7, Tainui and Taiaroa already released by the Institute are recorded. Fife-Tuscan (previously known as Cross 31) is in the last stage of selection. Two lines, 31,02 and 31,05, are under test, the former is slightly better in straw, yield and quality. The latter, however, has shown resistance to stem weevil, while the former has not yet been tested.

The six lines of Cross 60 under test have now been reduced to one, which yields slightly better than Tuscan and has quality intermediate between Tuscan and Cross 7. Cross 64, with quality equal to Marquis but with a lower yield than Tuscan, is to be tested in the Marquis-growing districts.

Counts of tiller production and survival and measurements of other yield factors were recorded on Tuscan, Hunters, Cross 7 and 21 cross-bred lines and these data are being used as an additional guide to selection, particular stress being laid on tiller survival.

Breeding for resistance to diseases and pests is not of prime importance in New Zealand, but a start has been made. Tests for resistance to stem weevil (in which 31,05 showed marked resistance), Hessian fly, loose smut and stem and leaf rusts were carried out and the data obtained are being taken into account in the work of selection. A number of crosses between rust-resistant lines obtained from Waterhouse in Sydney and Cross 7 and Hunters have been made and the  $F_1$  hybrids will be used in compound crosses.

- |      |                   |                    |
|------|-------------------|--------------------|
| 600. | BREAKWELL, E. J., | 633.11:575(94.2)   |
|      | HUTTON, E. M. and | 633.16:575(94.2)   |
|      | MELLOR, D. H. S.  | 633.13.00.14(94.2) |

**Cereal breeding and variety trials at Roseworthy College, 1938-39.**

J. Dep. Agric. S. Aust. 1940 : 43 : 524-33.

The earlier wheat crosses made at the College were simple crosses between high yielding varieties and types with high baking qualities. Later, compound crosses were made with the idea of introducing further desirable characters such as rust resistance. The later crosses contain much promising material, but several advanced generation selections of the earlier crosses also appear to be distinct improvements on varieties at present grown; among them are selections from Nabawa x Egyptian 4 (very high quality, high yielding, resistant to drought and flag smut and somewhat resistant to stem rust), Onas x Nabawa (drought resistant and high yielding), Cadia x Sword (outstanding combinations of yield and quality), Ford x Carrabin and Nabawa x Canberra.

A selection of Sword known as Rapier has been released to growers (cf. Abst. 605).

Selections from the barley crosses Prior x Beavan's Special and Prior x Roseworthy Oregon are very promising and one selection from the former cross has now been released (cf. Abst. 605). Variety trials with wheat, oats and barley are reported.

- |      |            |                  |
|------|------------|------------------|
| 601. | RAW, A. R. | 633.11:575(94.5) |
|------|------------|------------------|

**Wheat breeding. Progress and development.**

J. Dep. Agric. Vict. 1940 : 38 : 1-2, 25.

The past achievements of wheat breeders in Victoria are briefly discussed. It is now realized that further advances are most likely to be made by breeding wheats especially suited to particular districts rather than to the whole State, and a number of subsidiary breeding stations in representative localities have been set up in recent years. New hybrids are now all tested for resistance to flag smut and for milling and baking quality, lines inferior in these respects being eliminated at an early stage.

Several lines combining high yield, good grain quality and resistance to flag smut are now undergoing final yield tests.

- |      |                  |                    |
|------|------------------|--------------------|
| 602. | WENHOLZ, H.      |                    |
|      | PRIDHAM, J. T.,  |                    |
|      | VEARS, C. K. and |                    |
|      | CURTEIS, W. M.   | 633.11:575:007(94) |

**Wheat varieties in Australia.**

Agric. Gaz. N.S.W. 1940 : 51 : 65-68, 133-37.

These are further instalments of the serial article previously referred to in "Plant Breeding

Abstracts" (cf. Vol. X, Abst. 272). On p. 65 G. S. Gordon's wheat breeding achievements are summarized; his varieties include Free Gallipoli, Sepoy, Ghurka and an improved selection of Rane. On pp. 133-34 the value of South African wheats to the Australian grower and breeder is discussed. The variety Du Toit and selections from it, notably Ward's Prolific and Gluyas have been of considerable direct importance and have also entered into the ancestry of many valuable Australian varieties. The South African wheat Early Baart has also been much used as a parent.

603. MACINDOE, S. L. 633.11:575.11:007(94)  
**William Farrer's contribution to our knowledge of inheritance.**  
 J. Aust. Inst. Agric. Sci. 1939 : 5 : 208-12; also Agric. Gaz. N.S.W. 1940 :  
 51 : 63-64. (Abst.)

Farrer at a very early date demonstrated the heritability of rust and bunt resistance and baking quality in wheat and demonstrated the independent inheritance of certain pairs of characters, such as rust resistance and early maturity.

604. 633.11:575.11:581.46  
 633.11:576.16:581.9  
 ELLERTON, S. 633.11:575.242:575.127.2:576.356.2  
**Genetics and gene distribution in *Triticum vulgare* Vill. and other *Triticum* species.**

Abstr. Diss. Univ. Camb. (1938-1939) : 1940 : 22-23.

A genic formula for awn types is given and their distribution in Eurasia is outlined. It is suggested that *T. vulgare* arose in or near Afghanistan and was originally fully bearded. It appears that the other awn types arose subsequently in various regions as mutations and then spread back to the original centre. A hooded bearded tetraploid wheat from Abyssinia is found to differ from common bearded forms by a single gene which is linked to a factor for short straw.

A cytological study was made of crosses between *T. vulgare* and *T. durum*, *T. turgidum*, *T. dicoccum*, and *T. turgidum abyssinicum* Vav. Four types of cytological irregularity were observed, but there is no indication of any specific difference in the behaviour of *T. durum*. The *T. turgidum abyssinicum* cross is heterozygous for a segmental interchange. The third section of the dissertation is devoted to the study referred to in "Plant Breeding Abstracts", Vol. IX, Abst. 1289.

605. 633.11:575.42(94.2)  
 633.16:575(94.2)  
 635.656:575(94.2)

**New varieties of wheat, barley, and field pea.**

J. Dep. Agric. S. Aust. 1940 : 43 : 534-35.

Three newly released varieties are described.

Rapier is a wheat selected from the variety Sword and superior to it in yield, freedom from shattering and baking quality. It ripens a week earlier than the parent variety and is resistant to stem rust and flag smut.

The new two-rowed barley Maltworthy was selected from the cross Prior x Beavan's Special. It has a thin husk, is of high malting quality and usually outyields Prior. It also excels in freedom from shattering and is drought-resistant.

The Collegian field pea is a new variety selected from the cross Early Dun x White Brunswick. It is as early as the latter variety, is more vigorous and its pods are not prone to splitting.

606. 633.11:575.42(94.6)  
**Improved wheat variety : selection from Braemar Velvet. Certified seed available for coming season.**

Tasm. J. Agric. 1940 : 11 : p. 41.

The new variety Strathroy, released from the Cressy Research Farm, Tasmania, ripens about a week earlier and has yielded 5% more than the parental variety Braemar Velvet in tests extending over four years. Though a winter wheat, it may prove to be suitable for early spring sowing and tests to decide this point are being made. The variety has no greater resistance to rusts and smuts than Braemar Velvet.

607.

633.11:576.312.34:576.16

633.18:576.312.35

633.14:576.312.34:576.312.315

PATHAK, G. N.

**Studies in the cytology of cereals.**

J. Genet. 1940 : 39 : 437-67.

A study was made of the chromosome morphology of various species of *Triticum*, *Aegilops*, *Secale* and *Oryza*, either of the whole chromosome complement or of the chromosomes with nucleolar organizers.

In the diploid species *Triticum monococcum* and *T. aegilopoides* five chromosome types could be recognized, two pairs having satellites. Occasional quadrivalents were observed at meiosis in *T. monococcum* and there were also some signs of secondary association. It is suggested that these facts all indicate that the basic chromosome number in *Triticum* is five, as has already been concluded in the case of *Oryza*, and that seven is a secondarily derived number in the *Gramineae*.

*T. durum* (a tetraploid wheat) has one pair of chromosomes with secondary constrictions and one with satellites. It therefore could not have arisen by duplication of the *T. monococcum* complement. It is suggested that the second (B) genom of *T. durum* was derived from a diploid species of *Aegilops* having a pair of chromosomes with secondary constrictions.

*T. Spelta* and *T. vulgare* have one chromosome pair with secondary constrictions and two with satellites and it is suggested that their progenitors were a tetraploid wheat and the diploid *Aegilops squarrosa*. This form has hollow stems, is susceptible to rust and may be one of the parents of the tetraploid species *Ae. cylindrica* and *Ae. crassa*, with which it occurs in Turkestan.

The organization of the nucleolus was observed in *Secale cereale*. This species has one pair of chromosomes with secondary constrictions and no satellites.

Among the various forms of *Oryza* studied were *O. Eichingeri* Peter and *O. sylvestris* Stapf, which were both found to be secondary octoploids with  $2n = 48$ .

608.

633.11:581.142:631.521.6(71.24)

633.16:581.142:631.521.6(71.24)

633.1:581.143.26

HARRINGTON, J. B. and

KNOWLES, P. F.

**Dormancy in wheat and barley varieties in relation to breeding.**

Sci. Agric. 1940 : 20 : 355-64.

Comparative tests of dormancy made on the principal wheat and barley varieties of Saskatchewan during 1937 and 1938 are reported, and the varieties ranked according to their relative freedom from sprouting in the ear. Although to some extent a matter of good luck rather than deliberate breeding, it is noted that the new rust-resistant wheat varieties Renown, Apex and Thatcher have at least as much resistance to sprouting in the ear as the standard varieties Reward and Marquis.

609.

HARRINGTON, J. B. and

KNOWLES, P. F.

633.11:581.142:631.521.6(71.24)

**The breeding significance of after-harvest sprouting in wheat.**

Sci. Agric. 1940 : 20 : 402-13.

Data are presented on the amount of sprouting observed in the ears of 17 varieties and 157 selected hybrid lines of ripe, standing wheat. The amount of sprouting in the varieties ranged from 3.9 to 78.8%, the least affected being the rust-resistant varieties Apex Sask. 189, Thatcher and Renown, while the worst was the variety Garnet. In general the progeny of any one cross ranged between the parental values in the amount of sprouting, but some cases of transgressive segregation were observed, e.g. Garnet x Reward III-36-123 averaged 1.2% of sprouting as compared with parental values in the same test of 88.2 and 16.5% respectively. There is some evidence that selection of the hybrid lines on the basis of good grain appearance had led to some degree of elimination of lines prone to sprouting but this was by no means complete and the need for sprouting tests is evident.

A very close correspondence was observed between amount of sprouting and the degree of dormancy of the seed, and dormancy tests (cf. Abst. 608) would be more useful to the breeder since harvest weather conditions which induce sprouting in the ear only occur sporadically.

610.

CHURCHWARD, J. G.

633.11:2.45-1.521.6:575.11

633.11:575.11:519.241.1

**Studies on physiologic specialisation of the organisms causing bunt in wheat, and the genetics of resistance to this and certain other wheat diseases. Part II. Genetical studies.**

J. Roy. Soc. N.S.W. 1938 : 71 : 547-90.

Extensive genetic studies on the cross Federation x Hope are reported. In this cross resistance to a single isolate of *Tilletia tritici* was determined by one dominant gene, but there were also modifiers which led to the production of lines developing a small quantity of bunt.

Field resistance to stem rust was determined by at least two genes and probably also several modifiers. In the greenhouse seedling resistance to races 33 and 34 of *Puccinia graminis* was found to be determined by a single gene in each case, resistance to race 34 being fully recessive while resistance to race 33 was dominant.

Studies on the  $F_3$  showed that there was a single major factor for resistance to flag smut.

In addition to the above studies on disease resistance, it was determined that the characters winter v. spring growth habit and early v. late emergence of the first leaf from the coleoptile were each determined by a single gene. Awn type and grain colour were determined by two genes each, while grain colour was dependent on three genes. The inheritance of time of maturity proved to be complex.

Strong correlations between stalk and coleoptile colour were observed and time of maturity appeared to be related to resistance to the various diseases studied.

611.

McCALLA, A. G.

633.11:664.641.016:519.241.1

**Varietal differences in the relation between protein content of wheat and loaf volume of bread.**

Canad. J. Res. 1940 : 18 : Sect. C : 111-21.

Within any one variety of hard red spring wheat experiments prove that loaf volume obtained with the malt-phosphate-bromate formula (1 mg. of bromate per 100 gm. of flour) shows a close, positive, linear correlation with protein content. There are, however, great differences between varieties in the regression coefficient of loaf volume on protein and this regression coefficient must be regarded as a varietal characteristic.

In the variety Reward the regression coefficient is high (i.e. while high-protein Reward has good baking quality, low-protein samples are very poor) and it is pointed out that this variety may be an unsatisfactory parent for use in breeding varieties for use in the north of Canada, where protein content is likely to be low.

612.

FRANKEL, O. H.

633.11:664.641.016:578.08:575

**A critical survey of breeding wheat for baking quality.**

J. Agric. Sci. 1940 : 30 : 98-112.

An extensive series of quality tests on several New Zealand wheats and hybrid selections is reported. The methods used were both direct (baking tests) and indirect (Pelshenke's wholemeal fermentation test, the gluten swelling test, the Chopin extensimeter and the Brabender farinograph). Protein content determinations were also made. The conclusion was reached that no individual test was sufficiently reliable to prevent losses of valuable material when used as a basis for selection. This was particularly true of methods suitable for testing individual plants but such quality testing in the  $F_2$  is not regarded by the author as being a very useful adjunct to the breeder. The most reliable tests were the "strength" score as determined in the baking process and the farinograph record. It is suggested that at present the best procedure open to the breeder is to carry on agronomically promising lines to a stage where comprehensive tests using a number of selected methods can be carried out, preferably over a number of seasons.

The author concludes that the development of really satisfactory testing methods depends upon increased knowledge of the fundamental chemical and physical properties which contribute to "quality". Such knowledge is also a necessary basis for really satisfactory studies of the inheritance of baking quality.

### OATS 633.13

613.

CARSON, G. P.

633.13:575-18:519.241.1

**The inheritance of certain quantitative characters in oats.**

Abstr. Diss. Univ. Camb. (1938-1939) : 1940 : 17-18.

The inheritance of a number of quantitative characters was studied in the oat cross Resistance x 109/1/2 (a segregate from Grey Winter x Argentine).

The husk percentage of the primary grains of the spikelet was found to be determined by multiple genes and there was evidence that these genes were not simply additive in effect. The date of emergence of the first spikelet was shown to be inherited on a monogenic basis, earliness being incompletely dominant over lateness. Caryopsis length was determined by multiple genes, the action of which appeared to be additive.

Culm length proved to be an unsuitable character for genetic studies, but the data obtained were not at variance with a Mendelian interpretation.

Correlation studies showed that a low husk percentage tends to be associated with a long caryopsis.

#### BARLEY 633.16

614. ROBERTSON, D. W. and  
COLEMAN, O. H. 633.16:575.242.061.633:575.116.1  
**The addition of two factor pairs for chlorophyll-deficient seedlings to the linkage groups of barley.**  
J. Genet. 1940 : 39 : 401-10.

A recessive orange seedling mutant found in the barley variety Trebi IV and a recessive virescent seedling type in the variety Minnesota 72-8 are described. Each is determined by a single gene pair, the symbols used being *Or-or* and *Y-y* respectively, and both normally lead to the death of the seedling, though under high temperature greenhouse conditions the orange seedling type may mature.

Linkage studies show that *or* and *y* are both located in group I, the gene order being *Vv* (non-six-row v. six-row), *Yy*, *Ff* (green v. chlorina), *Or or*.

#### RICE 633.18

615. POGGENDORFF, W. H. 633.18:575(94)  
**Rice culture in Australia.**  
J. Aust. Inst. Agric. Sci. 1939 : 5 : 193-99.

The extent and history of rice cultivation in various states of the Commonwealth are summarized. Commercial production is now confined to the Murrumbidgee Irrigation Areas of New South Wales, and a Rice Research Station was established in 1929. Work in progress includes breeding (the improved strains Late Caloro, Caloro II and Colusa 180 are now available) and variety testing, as well as research into such matters as the laboratory determination of cooking quality. Breeding problems include the production of high yielding rices of good cooking quality, work on the heritability of susceptibility to sun cracking of the grain and the production of varieties with a shorter flowering period than those at present available.

616. JAGOE, R. B. 633.18:575.42(91)  
**Padi selection and varietal trials 1938-1939.** 633.18.00.14(91)  
Malay. Agric. J. 1939 : 27 : 468-512.

This report contains an account of variety trials conducted at most of the seven rice experiment stations and 51 test stations now established in the Malay Peninsula, Brunei and Labuan. In addition the selection work that is being carried out at some of the stations is briefly reviewed.

An editorial comment on the report appears on pp. 466-67.

#### BAMBOO 633.289

617. HUSSAINY, S. A. 633.289:575.247.061.63  
**Vegetative sports in the bamboo (*Bambusa arundinacea* Willd.)**  
Curr. Sci. 1940 : 9 : p. 132.

A clump of *B. arundinacea* showing a striped bud sport is illustrated. This is another character in which *Bambusa* resembles sugar cane, with which it has now been crossed.

#### ROOTS AND TUBERS 633.4

618. RAMANUJAM, S. 633.42:575.242:581.466  
**An apetalous mutation in turnip (*Brassica campestris* L.).** 633.42:575:578.08  
Nature, Lond. 1940 : 145 : 552-53.

A recessive mutant type of turnip in which the petals are absent is described. It is self-fertile

and also self-pollinating and it is suggested that the character may be of great use to breeders as an aid to maintaining the purity of a variety, since any out-crosses would have petals and therefore be conspicuous. The amount of cross-pollination so far observed in the original strain is very low. Genetic studies are being continued.

619. McINTOSH, T. 633.491:575(411)  
**The importance of the variety in potato production.**  
 Gdnrs' Chron. 1940 : 107 : 116-17, 132; also Advanc. Sci. 1940 : 1 : 313-14.  
 (Abst.)

The extent of variation within the potato is discussed with reference to the problem of maintaining varietal purity. Recurrent mutants such as "bolters" and "wildings" are specially mentioned and the evidence that some of them are periclinal chimaeras is advanced. The most important commercial varieties are classified according to their resistance to viruses X and A and the bearing of these facts on the technique of "seed" production is pointed out. In discussing potato breeding it is stated that considerable progress may still be made in yield, cooking quality and resistance to virus diseases and to common scab by breeding within *Solanum tuberosum*, and the variety Craig's Defiance, which is field-immune to viruses A, B, C and X is cited as an example of progress made in this way. For breeding for resistance to blight and frost, however, crossing with South American species followed by repeated back-crossing to *S. tuberosum* seems necessary. *S. Antipoviczii* offers possibilities as a source of blight resistance and *S. curtilobum* is important as a frost-resistant parent while *S. demissum* is a promising source of resistance to both.

Some of the newer South American species appear to be immune to corky scab and others are immune to blackleg; some are resistant to virus disease and some to Colorado beetle attack. Still others may be valuable for breeding varieties suitable for the warmer parts of the world.

620. LEIPER, R. T. 633.491-2.6-1.521.6:575  
**The potato eelworm problem of to-day.**  
 J.R. Agric. Soc. 1940 : 100 : Pt III : 63-73.

In reviewing the problem it is mentioned that some of the potatoes collected in Mexico and S. America on the expedition financed by the Council of the Imperial Agricultural Bureaux show considerable resistance to eelworm infection. The possibility of breeding resistant commercial types is therefore indicated.

### FIBRES 633.5

621. 633.51:575(41)  
**Progress reports from experiments stations. Season 1938-1939.**  
**Programmes of experiments, Season 1939-1940.**  
 Emp. Cott. Gr. Corp. Lond. 1940 : Pp. 198.

NOWELL, W. and

MUNROE, J. W.

**A review of the work of the Experiment Stations, season 1938-39,**  
**with a note on the entomological work.**

Emp. Cott. Gr. Corp. Lond. 1940 : Pp. 18.

The following sections of the first publication will be of interest to plant breeders:—

*Peters, R. W. Queensland. Cotton Research Station, Biloela.*  
*Progress Report for the season 1938-39. (pp. 1-12).*

Work on breeding for jassid resistance has been continued, the methods adopted being (1) crossing resistant cottons such as U.4 with susceptible big-bolled Upland cottons of desirable type, with repeated back-crossing to the big-bolled parent and (2) individual plant selection for resistance within the commercial Upland varieties already grown. Crosses and back-crosses involving U.4 and (U.4 x Cambodia) as resistant parents and the popular Upland variety Miller are already to hand. The U.4 x Cambodia material transmitted greater jassid resistance to the progeny, and it has therefore been decided to use Cambodia itself as a source of resistance. Selection work on the variety Miller has also been continued and a number of apparently jassid-resistant plants have been selected.

MacDonald, D.  
Fielding, W. L. and  
Ruston, D. F.

South Africa. Cotton Experiment Station, Barberton. Progress Report for the season 1938-39. Cotton breeding and field experiments. (pp. 15-25).

Rose, M. F.

Rotation crops. (pp. 27-31).

Breeding work on cotton was confined to U.4 strains and U.4 x Cambodia crosses. The results of variety trials involving 43 different strains are reported: they illustrate the progressive improvement that has been brought about by selection alone. Crosses between U.4 derivatives were made in an attempt to combine the strength and yield of 5143 with the high ginning percentage and better lint of 5149.

*G. trilobum* was found to be as susceptible to bollworms as *G. hirsutum*.

Attempts to find strains resistant to *Alternaria* failed; it is concluded that it is a "debility" disease that does not develop in healthily growing plants.

A collection of types is being made with a view to studying acclimatization and "new place" effects.

Maize lines derived from the Peruvian and Hickory varieties showed in some cases high or complete resistance to streak disease. Intra- and intervarietal crosses to increase streak resistance and incorporate it in other varieties are well under way and are very promising.

Bowmaker, P. A.

South Africa. Cotton Experiment Station, Magut, Natal. Progress Report for the season 1938-39. (pp. 65-70).

Cotton variety trials are reported.

Lochrie, J. V.

Swaziland. Cotton Experiment Stations, Bremersdorp and Croydon. Progress Report for the season 1938-39. (pp. 71-78).

Cotton variety trials were carried out. The continued supremacy of the U.4 strain 5143 and other 052 derivatives is noted.

Selection work on maize and kaffir corn was continued but work on groundnuts has been stopped and the best strains bulked and distributed for cultivation.

Peat, J. E.,  
McKinstry, A. H. and  
Prentice, A. N.

Southern Rhodesia. Cotton Station, Gatooma. Progress Report for the season 1938-39. (pp. 81-88).

One of the bulked strains of U.4/64 parentage, 7L.1, has proved outstanding in both wet and droughty years. Further selections of this strain are being made. Several of the 1938 multiplication lots also show considerable promise, single plant selections from them showing better lint than 7L.1. Several U.4 x Cambodia crosses and back-crosses also showed well and will be tested against U.4 strains.

Tothill, J. D.,  
King, H. E.  
Knight, R. L. and  
Anson, R. R.

Anglo-Egyptian Sudan. Progress Report on the work on cotton. Season 1938-39. (pp. 92-98).

Resistance to leaf curl and blackarm in Sakel strains and the development of American Upland types for the Nuba mountains and the Equatorial area are the chief problems. At the Gezira Research Farm N.T. 2/36 has continued to show improved yields compared with Sakel and its leaf curl resistance has been demonstrated. The original N.T.2 stock is yielding further promising sub-strains. Subtypes of X1530 and X1730 so far tested on a field scale have not shown any marked improvement over X1730 A but further sub-strains showed considerable promise in small scale trials. At the Shambat substation work on the transference of blackarm (*Bacterium malvacearum*) resistance to Sakel strains is continuing, the Upland variety Uganda B.31 being used as the source of resistance and recurrent back-crosses to Sakel strains being carried out. The genetic study of the resistance of B.31 has been published (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1312). Some of the later back-crosses are indistinguishable from Sakel in type and the early production of resistant commercial strains is promised.

At the Kadugli substation variety tests have not revealed substantial yield differences but the new sub-strain N.T.58 (which will reach the variety testing stage next season) is very promising, being large-bolled, fruitful and resistant to blackarm and jassid.

For Equatoria the suitability of 511C has been further established.

Nye, G. W. and  
Jameson, J. D.

Uganda. Cotton Experiment Stations, Bukalasa  
and Serere. Progress Reports for the season  
1938-39. (pp. 100-12).

At Bukalasa B.P.52 remained superior to Local Buganda but its resistance to blackarm could be improved; probably this can only be done through hybridization. B.181 is a promising variety resistant to blackarm and wilt (*Fusarium* and *Verticillium*) and high yielding but its lint characters are not too satisfactory and crossing with B.P.52 has been carried out in order to effect improvement. Mass selection of Local Buganda showed the paucity of strains having satisfactory lint characters, and the variety has a low ginning percentage. B.P.52 shows a reasonable improvement in this direction.

At Serere results show that the development of the U.4 4 2 strain reached its climax in S.P.84, later selections being less good. S.P.84 itself has maintained its good characteristics but S.P.102 has degenerated considerably. N.17 has yielded a number of very hairy re-selections and the type has been much improved. The programme of hybridization described in previous reports has been continued. Variety trials and spinning tests are reported.

At Bukalasa trials with soya beans were carried out.

Wight, N. M.,  
King, J. G. M.,  
Eyre, J. C. and  
Stenhouse, A. S.

Tanganyika Territory. General Progress Report  
on cotton work 1938-39. (pp. 113-38).

At Ukiriguru selection work is now concentrated on Mz. strains and one very promising new selection, Mz.561 06 has appeared.

At Lubaga cotton variety trials were carried out and mass and single plant selections were made from 998 and U.4 Bulk.

At the Kingolwira Extension Farm more attention will henceforth be paid to resistance to jassids, which this year notably reduced yields. A variety trial is reported.

Variety trials on rotation crops were also carried out in various parts of the Territory.

Ducker, H. C.,  
Miller, W. L. and  
Hoyle, S. T.

Nyasaland. Cotton Experiment Station, Domira  
Bay. Progress Report for the season 1938-39.  
(pp. 139-50).

The 1938 harvest was of the lowest quality yet recorded, this apparently being a seasonal fluctuation found in pure as well as in mixed strains. More attention will be paid to lint length, hair weight and maturity in future breeding. Technological data have enabled the number of U.4 strains under trial to be cut down. Selection work on the remaining strains and on various hybrids is continuing. Progeny row trials are to be instituted as an aid to discarding undesirable strains at an early stage.

Mayo, J. K.

Nigeria. Progress Report on work on cotton in the  
Northern Provinces for the season 1938-39.  
(pp. 161-63).

Bamtefa, A. O.

Progress Report on cotton selection work in the  
Southern Provinces for the season 1938-39.  
(pp. 163-65).

In the Northern Provinces breeding work has consisted of further trials and re-selections of D.5, D.8 and D.30, three high-yielding strains of Allen. These strains are high yielding and disease resistant.

In the Southern Provinces the work in hand consists of the maintenance of Improved Ishan A (*G. barbadense*) and an attempt to improve it further by crossing with Sea Island and then back-crossing once or twice to the Ishan A parent. Although the results of this back-crossing were at first encouraging it now appears that the back-crossed cottons are not as smooth as was originally anticipated.

Hutchinson, J. B.,  
Silow, R. A. and  
Stephens, S. G.

Trinidad. Cotton Research Station, Genetics  
Department. Progress Report for the period  
January-October, 1939. Genetic research.  
(pp. 171-76).

Genetical work on the crinkled multiple allelomorph series (*cr*), the leaf shape series (*L*), the *R* series for anthocyanin distribution, lint density and quantitative inheritance has been carried out, in addition to linkage studies and work on other genetical problems. Much of

this work has already been published separately and summarized in "Plant Breeding Abstracts". Work on the induction of polyploidy by the use of colchicine has also been conducted.

Manning, H. L.

West Indies. Cotton Experiment Station, St. Vincent. Progress Report for the season 1938-39. (pp. 182-96).

Ten strains of V.135 were included in a trial with ten strains of a V.135 graft which has been propagated since 1928. The old strains (designated P.16) were inferior except in the characters node number, number of days to flower and ginning percentage. The later strains differed significantly between themselves in lint length. The strain V(38)3 has proved outstanding in lint length, mean lint index and seed weight and ginning percentage.

Various VH hybrids, derived from (Montserrat Sea Island x V.135) x Montserrat Sea Island were tested against V.135. VH.9 in particular is outstanding, showing the desirable V.135 type with additional recombined characters of the Montserrat strain. It is superior to V.135 in seed cotton per plant, lint length, seed weight and lint index. Progenies of VH strains 8, 9 and 10 are to be included in the main breeding trial in 1939-40.

Red Sea Island proved inferior to V.135 in various respects.

A quantitative inheritance experiment was carried out on a series of Sea Island crosses and a study was made of a semi-sterile and a fuzzed mutant of V.135. The heterozygous semi-sterile type was distinguishable from homozygous normal. The ratio obtained was not a 1 : 2 : 1, the disparity being due, it is believed, to the death of most of the mutant homozygotes and the mutation of many heterozygotes to the normal. The fuzzed type also showed a complicated ratio.

The second publication includes a brief review of the plant breeding work referred to above.

622. HUTCHINSON, J. B. 633.51:575:581.6(72.9)

**The quality of West Indian Sea Island cotton. A note on investigations made during the year 1938-1939.**

Rep. 4th Ord. Gen. Mtg W. Ind. Sea Island Cott. Ass. (Inc.) Antigua (1939) 1940 : 25-26.

The improvement of the lint index of Montserrat Sea Island cotton from 6.1 in 1931 to 6.6 in 1938 has led to an increase in coarseness of the fibre. The necessity for regular spinning tests to keep a check on any such decreases in quality due to breeding for other characters is stressed.

623. MOHAMMAD AFZAL and SARUP SINGH.

633.51:575.11:575.242:581.466

**The genetics of a petaloid mutant in cotton.**

Indian J. Agric. Sci. 1939 : 9 : 787-90.

A petaloid mutant in which almost all the stamens are transformed into petal-like structures has been found in a pure strain of *Gossypium arboreum*. The mutant differs from the parent strain in a single gene. The dominance of the petaloid character over the normal is incomplete and ratios of 1 : 2 : 1 were obtained. In the intermediate class the anthers are transformed into petal-like structures only in the lower half of the staminal column. B. P. P.

624. HUTCHINSON, J. B., GHOSE, R. L. M. and BHOLA NATH.

633.51:575.113.3.061.1:581.45

**Further studies on the inheritance of leaf shape in Asiatic *Gossypium*s.**

Indian J. Agric. Sci. 1939 : 9 : 765-86.

This paper deals with an additional allelomorph of the L series of leaf shape genes, found in a strain of *G. arboreum* and designated  $L^N$ . The genetics of this type has already been dealt with in "Plant Breeding Abstracts", Vol. IX, Abst. 1311.

625. BOZA, B., T. and MADOO, R. M.

633.51:576.16

**Relationship of *Gossypium Raimondii* Ulbr.**

Nature, Lond. 1940 : 145 : p. 553.

In the cross *G. hirsutum* x *G. Raimondii* the mean meiotic conjugation was found to be  $12.57_I + 11.65_{II} + 0.37_{III} + 0.126_{IV}$ , with a chiasma frequency of 1.62 per bivalent. On the

basis of these observations it is suggested that *G. Raimondii* is more closely related to *G. Armourianum*, *G. trilobum*, *G. Harknessii* and *G. aridum* than to *G. Davidsonii* and *G. Klotzschianum*, to which species Hutchinson and Newcombe (cf. "Plant Breeding Abstracts", Vol. X, Abst. 289 and 794) have recently suggested that *G. Raimondii* is most closely allied.

626. AMIN, K. C. 633.51:576.356.5:581.04  
633.51:575.127.2

**A preliminary note of interspecific hybridization and use of colchicine in cotton.**

Curr. Sci. 1940 : 9 : 74-75.

Back-crosses of hybrids between New World and Old World cultivated cottons to the New World parents have been obtained, though the seed set on the  $F_1$  plants was very small. The back-crosses may be sterile, of intermediate fertility or completely fertile. Their progeny show marked fertility in some cases and a predominance of New World characters. Colchicine treatment has been applied to a number of cotton species and hybrids. The plants of *G. herbaceum*, *G. arboreum* and *G. hirsutum* with the doubled chromosome number were sterile, showing very defective bursting of the anthers. Fertile types resulted from treatment of the sterile hybrids *G. arboreum* x *G. anomalum*, *G. Davidsonii* x *G. anomalum* and *G. hirsutum* x *G. herbaceum*.

627. HARLAND, S. C. 633.51:576.356.5:581.04

**New polyploids in cotton by the use of colchicine.**

Trop. Agriculture, Trin. 1940 : 17 : 53-54.

Using several methods of colchicine treatment, chromosome doubling was induced in *G. arboreum*, *G. Thurberi*, *G. barbadense*, *G. hirsutum* and in several species hybrids. The characters of the polyploids are tabulated. The autopolyploids were sterile except in the case of *G. hirsutum*, in which some flowers were completely fertile. These produced lint 20% longer than in the normal form but the hairs were thick and weak and it is doubtful whether 104-chromosome cottons will represent any improvement.

The amphidiploid *G. arboreum* x *G. Thurberi* is female fertile when crossed with the tetraploid New World species (which are allopolyploids derived from similar crossing between Asiatic and American diploid species). The resulting bolls have a full complement of seed and since the *G. Thurberi* genom carries immunity to the pink boll worm the amphidiploid is likely to be very valuable in breeding work. It has been crossed with a large number of varieties of *G. hirsutum* and *G. barbadense*.

The hexaploids derived from the triploid hybrids between *G. barbadense* and *G. aridum*, *G. Thurberi* and *G. Armourianum* are also promising. The lint of the last two at least is long and fine and the wild parent carries resistance to drought and to a number of diseases and insects. The hexaploids are fertile and very vigorous. They have been intercrossed and hybrids are now available for testing.

628. STEPHENS, S. G. 633.51:576.356.5:581.04

**Colchicine treatment as a means of inducing polyploidy in cotton.**

Trop. Agriculture, Trin. 1940 : 17 : 23-25.

The use of colchicine in studies of the phylogeny of cotton species and also possibly in cotton breeding are pointed out. Experiments on the varieties St. Vincent Sea Island Superfine V135 (*Gossypium barbadense*) and N14 (*G. arboreum* var. *neglectum*) are reported. Five different treatments were tried, each with varying dosages of colchicine; the parts treated were (1) germinating seeds, (2) plumules in the cotyledon stage, (3) the apical bud of the main stem, (4) flower buds and (5) young bolls. Progenies with the doubled chromosome number were obtained only with variety N14 and with treatments (1) and (2). Treatment (1) gave plants of V135 which were abnormal in type and were male-sterile.

Tetraploid plants of N14 showed the usual characters of polyploids. The lint hairs were 3-5 mm. longer than in the parent but were sparser. The tetraploid crosses freely with Upland and Sea Island cottons, the hybrids being vigorous but sterile.

Colchicine treatment is being used to double the chromosome number in sterile species hybrids and a hexaploid has already been obtained from the sterile triploid *G. barbadense* x *G. Raimondii*.

It is reported that the leaf distortion caused by colchicine is sometimes found also in the progeny of treated plants.

629. 633.51:581.47:519.241.1:631.557:575(54.8)

RANGANATHA RAO, V. N.

633.51:575.11-184:581.466

**A study of the inheritance of locular composition in Mysore-American cotton fruit and its relation to yield.**

J. Mysore Agric. Exp. Un. [1940] : 18 : 1-11.

By selection from the cross *Gossypium hirsutum* (local Doddahatti) x *G. peruvianum*, two strains of Mysore American cotton with a very high percentage of 5-lock bolls were developed. The results clearly indicate that loculus number in cotton is heritable. It was shown that the amount of seed cotton per loculus is not significantly different in 4-lock and 5-lock bolls, the 5-lock boll therefore yielding considerably more cotton per boll.

630. 633.523:575(54.1)

**Indian jute research.**

Indian Fmg 1940 : 1 : 81-82.

The research work being conducted by the Indian Central Jute Committee's recently established agricultural and technological research laboratories is reviewed. It includes the testing of the relative resistance of *Corchorus capsularis* and *C. olitorius* to various diseases and pests and the development of strains with yields similar to present-day types and improved spinning quality. Two possible ways of improving the quality are to select strains with the longest ultimate fibre cells and strains in which the network formed by the bundles of fibres has the largest possible mesh.

631. H....., A. G. 633.526.1:581.162.5:575(67.82)

**Manila hemp seedlings.**

E. Afr. Agric. J. 1940 : 5 : p. 379.

It is noted that seeds of manila hemp (*Musa textilis*) sown at Amani, Tanganyika Territory, showed high germinability, although it has frequently been reported in the literature that fertile seeds are rarely produced by this crop. The possibility of breeding superior forms for use in East Africa is therefore indicated.

**SUGAR PLANTS 633.6**632. BOSE, S. S.,  
KHANNA, K. L. and  
MAHALANOBIS, P. C. 633.61:519.24:631.421**Statistical notes for agricultural workers. Note on the optimum shape and size of plots for sugarcane experiments in Bihar.**

Indian J. Agric. Sci. 1939 : 9 : 807-16.

A study was made of the relative efficiency of different plot sizes in a sugar cane yield trial, both on the basis of the actual yields and on the basis of yields adjusted by the covariance technique to compensate for differences in plant number. The most consistently efficient sizes were plots 45 feet long and either three or five rows wide. The larger size ( $\frac{1}{64}$  acre) is recommended for future trials where smaller plots would be difficult to work with.

633. KERR, H. W. 633.61:519.24:631.421(94.3)

**Field experimentation with sugar cane.**

Tech. Commun., Bur. Sug. Exp. Sta., Dep. Agric., Brisbane 1939 : No. 11 : 177-232.

The statistical principles underlying the practice of field experimentation with sugar cane are expounded and the more important modern experimental lay-outs described, worked examples based on sugar cane experiments being included. Finally comes a discussion of the practical aspects of sugar cane experimentation, based on Queensland conditions and experience. This bulletin will be of great value to all those who conduct field experiments on sugar cane.

634. MCINTOSH, A. E. S. 633.61:575(72.98)  
**Report on sugar cane breeding and seedling testing for the year 1938-1939.**

Agric. J. Barbados 1939 : 8 : 87-112.

This is a report of the year's work at the British West Indies Sugar Cane Breeding Station, Barbados.

A considerable number of crosses were made, using the lantern method. Further trials of the Hawaiian method of hybridization (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1317),

this time carried out in the open air, were abortive, the solutions being unable to keep the parent arrows alive long enough to allow flowering and seed maturation.

Much more attention is now being paid in the crossing programme to nobilizations than to pure noble cane breeding. In the first year seedling trials it was found that a much larger proportion of seedlings as selected from crosses in the nobilization group than from pure noble crosses, though the criteria adopted in selection were the same. Among the noble crosses, however, B.3013 x B.2935 was outstanding and larger populations of it will be planted in future.

The results of seedling trials through the various stages of selection are reported, as well as the later variety trials on different soil types. B.35187, previously noted as being mosaic resistant, has given exceedingly high yields and is being released for planting by smallholders in mosaic proclaimed red soil areas. It is derived from the cross B.3172 x B.391, the B.3172 parent being a seedling of P.O.J.2725 x B.H.10(12). It is particularly free from arrowing.

B.35245 has given excellent sugar yields in both early and late reapings, but is susceptible to mosaic and shows the maximum allowable leaf symptoms of gumming disease. The individual canes are long and thick and the juice quality excellent early in the crop. B.35187, on the other hand, is a late ripener.

The results of special investigations such as disease resistance trials carried out by the Station are to be published separately from time to time.

635. 633.61:576.16

JANAKI-AMMAL, E. K. 633.282:576.312.35:576.356.5

**Chromosome numbers in *Sclerostachya fusca*.**

Nature, Lond. 1940 : 145 : p. 464.

*S. fusca* (syn. *Saccharum fuscum* Roxb.), a near relative of *Saccharum spontaneum*, was found to have  $2n = 48$  in Orissa, while the Assam form, larger in habit, had  $2n = 96$ . In *Saccharum spontaneum* the chromosome number similarly increases from west to east. The basic number  $x = 6$  has been found only in two other genera of the *Andropogoneae*, *Miscanthus* and the dibasic *Saccharum spontaneum*. Its discovery in another genus, more closely allied to *Saccharum* than *Miscanthus*, makes it easier to understand the origin of the dibasic cultivated sugar canes.

636. 633.61-1.524(56)

DILIEWIJN, C. VAN 633.61-2.111-1.521.6

**Wild and noble *Saccharum* in Asia Minor.**

Int. Sug. J. 1940 : 42 : p. 165.

The author reports the occurrence of *S. spontaneum* in the plain of Adana in South Anatolia, where temperatures as low as  $-6^{\circ}\text{C}$  are occasionally experienced. He suggests that this material would be of value in breeding for cold resistance and offers to supply seed.

A small amount of cane cultivation still persists in the same area, the yields reaching 20 tons per acre with unimproved varieties. This figure is capable of being considerably increased by the introduction of suitable new varieties.

637. 633.61-2.111-1.521.6:575(73)

B. . . . ., A. F.

**Cold resistant sugar cane.**

Cane Gr. Quart. Bull. 1940 : 7 : 175-76.

ANONYMOUS.

**Cold resistant sugar cane.**

Aust. Sug. J. 1940 : 31 : 568-70.

The first paper is an account of the work of Brandes referred to in "Plant Breeding Abstracts", Vol. X, Abst. 502. The second is a reprint of the same article, with a short editorial comment.

638. 633.61-2.111-1.521.6:575.127.2(73)

BRANDES, E. W. and

MATZ, J.

**Problems and progress in breeding Temperate Zone sugar cane.**

S. Afr. Sug. J. 1940 : 24 : 69-71; also Sug. J., N.O. 1939 : 2 : 3-6.

An account is given of the breeding work being conducted in the United States to produce cold-resistant canes which show vigorous early spring growth. This work has recently been summarized in "Plant Breeding Abstracts" (Vol. X, Abst. 502).

It is noted that the entire collection of wild sugar cane varieties assembled by the Bureau of

Plant Industry is now being grown at five stations of widely separated latitudes ranging from the equator to 37° N, in order to study plant reactions to the various conditions encountered.

639. D. . . . ., L. R. 633.682:575.127.2:576.356.5:581.04  
 633.71:575.127.2:576.356.5:581.04  
**The action and use of colchicine in the production of polyploid plants.**  
 E. Afr. Agric. J. 1940 : 5 : p. 369.

In the course of a review of the bulletin of the Imperial Bureau of Plant Breeding and Genetics of the above title, the use being made of colchicine in British East Africa is noted. At Amani several interspecific hybrids of *Manihot* have been made in an attempt to produce forms of cassava resistant to mosaic and other virus diseases. Attempts are being made to induce polyploidy in this hybrid material, and similar work is also being carried out on interspecific hybrids of *Coffea*.

## STIMULANTS 633.7

640. TUBBS, F. R. 633.72:575(54.8)  
**Address to the Ceylon Association in London.**  
 Tea Quart. 1939 : 12 : 160-66.

The breeding work of the Tea Research Institute in Ceylon is briefly outlined. A long-range programme of selection with a view to establishing superior clones is being carried out, as well as work designed more immediately to improve seed stock by eliminating inferior trees in existing seed-bearing areas and by planting new areas with carefully selected seed-bearers. Work on vegetative propagation and allied problems is being carried out in connexion with this programme.

641. WIGHT, W. and  
 BARUA, P. K. 633.72:575.2:575  
**The tea plant in industry : some general principles.**  
 Memor. Tocklai Exp. Sta., Indian Tea Ass. 1939 : No. 7 : Pp. 13.

The botanical nomenclature of tea is discussed and some aspects of its biology briefly dealt with. The chromosome number is 30. Cross-pollination seems to be the rule in nature and a loss of vigour on selting has been reported. Present-day types are very variable. It is pointed out that dark-leaved types contain more frost-resistant plants than light-leaved and that they contain relatively few bushes which combine good strength and quality although such dark-leaved bushes do exist. It is considered that the dark-leaved types are the more promising as breeding material.

642. LAMB, J. 633.72:581.6:578.08:575  
**A note on the manufacture of leaf from selected individual bushes.**  
 Tea Quart. 1939 : 12 : 183-85.

A method of manufacturing small quantities of tea from individual bushes has been developed in Ceylon, as an aid to the selection of high quality types. It has proved possible to estimate the quality of a sample from its behaviour during manufacture, and to forecast the taster's opinion with considerable accuracy. The variation in quality from bush to bush is extremely wide. The main types encountered are described.

643. SOLLY, N. 633.73:575(67.62)  
**A planter's impression of the work being conducted at the Scott  
 Agricultural Laboratories by members of the coffee team.**  
 Mon. Bull. Coffee Bd Kenya 1940 : 6 : 44-45.

The work of the Laboratories involves all aspects of coffee production, but selection work is the most important. Forms with high yield and a good type of bean combined with resistance to drought, leaf disease or coffee berry disease are required for different areas in Kenya, and individual tree recording and liquoring tests are being carried out on a large scale. Attention is also being paid to selection of rootstocks and to the technique of vegetative propagation. When superior types of coffee are ultimately selected they may be quickly brought into cultivation by top-grafting the trees in existing plantations.

644. HALL, C. J. J. VAN 633.73:575(92.2)  
**Coffee selection in the Netherlands Indies.**  
 J. Mysore Agric. Exp. Un. [1940] : 18 : 42-48.

ANONYMOUS.

A seleção dos cafeeiros nas Índias Neerlandesas. (**Coffee selection in the Netherlands Indies**).

Rev. Dep. Nac. Café Rio de J. 1939 : 7 : 347-49.

The first is a reprint of the article summarized in "Plant Breeding Abstracts", Vol. VIII, Abst. 1068, and the second a Portuguese version, translated from an article appearing in the "Revue Française d'Outremer".

645. EVANS, G. 633.74:575(72.98)  
**Research and training in tropical agriculture.** 634.771:575(72.98)  
 J.R. Soc. Arts 1939 : 87 : 333-50.

This is an interesting account of the research work which has been done at the Imperial College of Tropical Agriculture, Trinidad, on cacao and bananas. Publications dealing with this work have been summarized in "Plant Breeding Abstracts" from time to time. Breeding work on cacao centres chiefly on the study of fruitfulness and self-incompatibility and on the development of types resistant to *Marasmius*. Selections of the local mixture have also been made and propagated. In the case of bananas resistance to Panama disease (*Fusarium cubense*) and leaf spot (*Cercospora musae*) is being sought by crossing the susceptible Gros Michel with wild types. One hybrid of some promise, I.C.2, has so far been released.

646. POSNETTE, A. F. 633.74:581.162.52:631.557  
**Self-incompatibility in cocoa (*Theobroma* spp.)**  
 Trop. Agriculture, Trin. 1940 : 17 : 67-71.

Individual tree yield data collected at Aburi, Gold Coast suggest that self-incompatibility is an important factor limiting the yield of cacao. It is least common in the Amelonado variety and commonest in the Cundeamor, with Criollo intermediate. The scarcity of incompatible trees in commercial cacao plantings in the Gold Coast may help to account for the yields so greatly surpassing those of the West Indies. The studies also suggest that higher quality cacao varieties such as Criollo and Cundeamor may not be so inferior in yield to Amelonado as has been supposed, if care is taken to select only self-compatible individuals for comparison, and the production of high-yielding, high-quality types may therefore be a relatively simple matter.

It is shown that the age of the tree has no effect on self-compatibility, two exceptions in which old, self-incompatible trees had young shoots which were self-compatible being held to be due to bud mutation.

Studies on pollen tube growth and on mixed pollinations are inconclusive but they suggest that incompatible pollen leads to the production of an inhibitory substance in the style, and that this substance may retard the growth of compatible pollen applied to the same style.

## AROMATIC PLANTS 633.8

647. PAL, B. P. and 633.842:576.356  
 RAMANUJAM, S.  
**Asynapsis in chilli (*Capsicum annuum* L.)**  
 Curr. Sci. 1940 : 9 : 126-28.

An asynaptic plant of *C. annuum* found by the authors was shown to have 24 univalents at meiosis, with only occasional formation of one bivalent. Meiotic anaphase was irregular, some cells forming restitution nuclei. The pollen was nearly 90% sterile and few seeds were set. The progeny of this plant contained six diploids with normal pairing, two different primary trisomics and two triploids. The triploids showed varying numbers of trivalents, bivalents and univalents at meiosis and had about 80% of sterile pollen. They formed a few seeds. The trisomics had 30-40% of bad pollen and formed a good number of seeds.

## OIL PLANTS 633.85

648. KUMAR, L. S. S. and  
 PATEL, N. M. 633.854.54:581.162.32  
**Natural cross-fertilization in *Linum usitatissimum* L. (linseed)**  
**in the Bombay Deccan.**  
 J. Univ. Bombay 1940 : 8 : Pt 5 : (Biol. Sci. No. 8) : 105-10.

Using white v. blue flower colour as an indicator, it was concluded that at Poona there was 3.4% of natural crossing in linseed when the plants were spaced  $\frac{1}{2}$  in. to 3 in. apart in rows 12 in. apart, and 0.58% when the plants were spaced 12 in. apart each way.

649. ASHBY, M. 633.854.56:575(73)  
**The tung oil industry of the United States. Report of an inquiry**  
**carried out in Florida, Louisiana and Mississippi.**  
 Bull. Imp. Inst., Lond. 1940 : 38 : 5-32.

Various aspects of the tung oil industry of the United States are dealt with, among them breeding work. The species grown is *Aleurites Fordii* and the populations grown are exceedingly variable. Apart from low-yielding abnormal types such as the Craig Kidney and Moorei varieties, forms are found which bear fruit either singly or in clusters (the latter generally being the highest yielders) while some types branch at a much higher level than others, the high branching type often having weak crotches. The branching habit of a plant may be determined in the nursery, since the first branch is borne in the axil of the lowest cordate leaf on the main stem. The inheritance of this character is being studied.

Selection for yield is complicated by the widespread frost damage which occurs in most years. Some trees are apparently frost-resistant or escape frost by flowering late and seed from a number of such trees has been collected and grown for investigational work by the United States Department of Agriculture at their new tung research station at Bogalusa, Louisiana, where extensive breeding and other research work is being planned.

Preliminary hybridization work at Gainesville, Florida, was not successful owing to frost damage, but it is possible that in future *A. Fordii* x *A. montana* hybrids may be studied, since the latter species, though susceptible to frost, is late-flowering and frost-escaping types may therefore be obtained.

Experiments on vegetative propagation are being carried out in order to determine the best ways of propagating selected clones.

650. RICHHARIA, R. H. and  
 KOTVAL, J. P. 633.854.797:576.312.35  
**Chromosome numbers in safflower (*Carthamus tinctorius* Linn.).**  
 Curr. Sci. 1940 : 9 : 73-74.

A chromosome number of  $2n = 24$  was observed in five Indian forms of safflower, and 12 bivalents were also observed at meiosis.

## FRUIT TREES 634

651. CRANE, M. B. and  
 LEWIS, D. 634.13:575.11:582  
**Genetical studies in pears. II. A classification of cultivated varieties.**  
 J. Pomol. 1940 : 18 : 52-60.

The genetics of a number of vegetative characters in the pear has been studied and a classification of 81 cultivated varieties based on this study is presented. The key characters used, each of which is determined by a single gene pair are as follows: toothed (*S*) v. entire (*s*) leaf margin, eglandular (*E*) v. glandular (*e*) leaf midrib, hairy (*H*) v. sparsely hairy or glabrous (*h*) shoots, red or purple (*R*) v. green (*r*) and green (*G*) v. pale green (*g*) leaf colour. The dominant character of each pair is given first.

652. RAPTOPOULOS, T. 634.23:581.331.2  
 634.23:575.127.2:581.162.5  
**Pollen germination tests in cherries.**  
 J. Pomol. 1940 : 18 : 61-67.

Pollen germination counts were made on a large number of varieties of sweet, sour and Duke cherries as well as on various triploid hybrids and on *Prunus cantabrigiensis*. The percentage germination of most of the diploid varieties exceeded 70%, the triploid hybrids ranged from

0.8 to 1.6% and the tetraploids mostly ranged between 29 and 67%, though some were lower. Although there were exceptions, it appeared that in general the optimum germination of pollen of tetraploid varieties was obtained in a stronger sucrose solution than was the case in diploids.

The pollen of the diploids had a larger average diameter than that of the triploids and tetraploids.

There was a positive correlation between pollen size and germination. In the triploids there was no correlation between the percentage of normal tetrads and pollen germination.

#### VARIOUS SMALL FRUITS 634.4

653. 634.441:575.42"793"(54.8)  
634.651:575.42(54.8)

##### **Fruit research in Madras.**

Indian Fmg 1940 : 1 : 82-83.

The work in hand at the Fruit Research Station at Kodur includes the selection of mangoes which produce a large off-season crop. Vegetative progenies of such selections from three different varieties are under trial.

Pure line selection of papaya has recently been started at the Station and an extensive collection of types is being assembled.

#### PALMACEOUS AND OTHER TREE FRUITS 634.6

654. 634.651:577.8:575.116.4.061.6  
634.651:581.47:575-181

HOFMEYR, J. D. J.

**Genetical studies of *Carica papaya* L. I. The inheritance and relation of sex and certain plant characteristics. II. Sex reversal and sex forms.**

Sci. Bull. Dep. Agric. & For., S. Afr. 1938 : No. 187 : Pp. 64.

This is a full report of the researches previously published in brief in the papers summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 85 and Vol. X, Abst. 309. In addition to results there reported, preliminary experiments on the inheritance of fruit size and shape are described; both are clearly influenced by both the male and female parent in crosses, as also is the shape of the fruit cavity, and the possibility of selecting for these characters is pointed out. Fruit shape is also influenced by the sex of the plants, hermaphrodite plants producing elongated fruits.

A suitable sex-linked character would be of great use in nursery selection of papaya seedlings but none is yet known; it is possible that a suitable mutation may be induced by X-rays.

There is no difference in the vigour of male and female trees at the time of first flowering. Sex reversal in papaya was also studied. Female trees have never been known to show sex reversal, the commonest type of which is the production of a few hermaphrodite flowers on a male tree. This is believed to be due to the interaction of the environment with modifying factors. Hermaphrodite and male trees may for a part of their life-history behave as functional males and functional hermaphrodites respectively, but their genetic behaviour remains unchanged.

In a note at the end of the paper three-point experiments are reported which establish that the genes *m* (the sex-determining gene), *Y* (yellow flowers) and *P* (purple stem) are arranged in the following order in the chromosome with crossover percentages as given: *m*-25-*Y*-18-*P*.

655. SRINIVASACHAR, D. 634.662:576.312.35:581.3

**Embryological studies of some members of Rhamnaceae.**

Proc. Indian Acad. Sci. 1940 : 11 : Sect. B. : 107-16.

*Zizyphus Jujuba* was found to have a chromosome number of  $n = 20$  and *Z. Oenoplia* of  $n = 10$ . An embryological study of these species and of *Scutia myrtina* is reported.

#### OTHER FRUITS 634.77

656. 634.774:575.42:575.247  
634.774(94.3)

LEWCOCK, H. K.

**Pineapple culture in Queensland.**

Qd Agric. J. 1939 : 52 : 614-32; 1940 : 53 : 6-44, 266-77.

The first five chapters of this comprehensive treatment of the subject have so far been published. Chapters I and II deal with the history and economic importance and the general

characteristics of the pineapple, while Chapter V deals with the soil requirements of the crop. Chapters III and IV will be of special interest to the plant breeder. They deal with the varieties of the pineapple and its improvement by breeding and selection. The methods used in breeding hybrid pineapples in Hawaii are first outlined. Then after discussing the general principles of selection the most important undesirable bud mutants of the Smooth Cayenne variety are described and the methods which may be adopted by the planter to eliminate them are outlined. This aspect of pineapple culture has recently been dealt with by Groszmann in the same journal (cf. "Plant Breeding Abstracts", Vol. X, Abst. 61). The most desirable characters of the Smooth Cayenne variety are indicated and the method of clonal selection used by the breeder described. The final section of Chapter IV deals with the stump section and other methods of speeding up the rate of vegetative propagation of the pineapple, methods of special value to the breeder.

## FORESTRY 634.9

657. YOUNG, H. E. 634.975-2.8-1.521.6:575.42:575.11(94.3)  
**Fused needle disease and its relation to the nutrition of *Pinus*.**  
 Qd Agric. J. 1940 : 53 : 45-54, 156-77, 278-315.

In this article, the final instalments of which have not yet appeared, the genetical aspects of the problem of fused needle disease of *Pinus* are among those touched upon. A list of species in order of susceptibility is given. Preliminary genetic experiments conducted with open-pollinated seed were inconclusive. It is suggested that while susceptibility is probably genetically conditioned, the disease cannot be regarded directly as a genetic abnormality. Clonal selection is to be carried out with a view to isolating very resistant and very susceptible strains for plantation trials. Attempts at vegetative propagation for this purpose have been begun.

## VEGETABLES 635

658. HOWARD, H. W. 635.34:575.129:635.15:581.162.5  
 635.347:576.356.5  
**Experimental polyploidy in the genera *Raphanus* and *Brassica*.**  
 Abstr. Diss. Univ. Camb. (1938-1939) : 1940 : 23-25.

The substance of the thesis has been published, with additional data, in the articles summarized in "Plant Breeding Abstracts", Vol. VIII, Abst. 1404 and Vol. X, Abst. 567.

659. CALDER, R. A. 635.347:575(93.1)  
**Marrow-stem kale (*B. oleracea* L.). Investigations leading up to selection and seed production.**  
 N.Z. J. Sci. Tech. 1939 : 21 : 223-29A.

Marrow-stem kale as grown in New Zealand shows considerable variation. The present studies show that three main types may be distinguished—tall stemmy, medium leafy and short leafy. The taller types have a higher yield but a lower nutritive value, as evidenced by the higher ratio of stem to leaf and the higher proportion of woody tissue in the stem. Selfing was found to lead to considerable loss of vigour, and there was some self-sterility. Selection is being carried out to establish strains of each of the three main types, and plot trials and further selection are to follow.

Crosses with thousand-headed kale, Garton's hybrid kale and winter and spring cabbage are being carried out in an attempt to develop a marrow-stem kale less prone to premature shedding of the lower leaves.

660. STEBBINS, G. L. (jun.) 635.52:576.312.35(54)  
**Notes on some Indian species of *Lactuca*.**  
 Indian For. Rec. 1939 : 1 : (N.S.) : Bot. 237-45.

Notes are given on Indian species of *Lactuca*. The chromosome number of *L. Brunoniana*, *L. rapunculoides*, *L. longifolia*, *L. macrantha*, *L. Lessertiana* and *L. hastata* is reported as being  $2n = 16$ . All these species and *L. bracteata* have similar karyotypes, with considerable differences in chromosome size and a predominance of chromosomes with subterminal constrictions. Other Indian *Lactuca* species have previously been reported to have  $2n = 18$  chromosomes, while *L. orientalis* has  $2n = 36$ .

661. PARK, M. and FERNANDO, M. 635.646-2.3-1.521.6:575.24(54.8)  
635.646-1.524  
**A variety of brinjal (*Solanum Melongena* Linn.) resistant to bacterial wilt.**

Trop. Agriculturist 1940 : 94 : 19-21.

The new variety, Matale, is a local Ceylonese form which has probably been subjected to natural selection for resistance to *Bacillus solanacearum*. It is of good quality and has shown only 0.9-1% of infection on heavily infected land. Studies on the genetics of this wilt resistance are in progress and the variety is being crossed with other commercial varieties.

662. PELLEW, C. 635.656:575.116.1:576.356.2  
**Genetical studies on the first reciprocal translocation found in *Pisum sativum*.**

J. Genet. 1940 : 39 : 363-90.

Extensive genetic studies involving crosses between Hammarlund's *K*-line of *P. sativum* and normal lines are reported. Gametic sterility in such crosses was slightly below 50% and the one family which was examined cytologically showed about 20% of trisomic plants. Six genes were found to be linked with the translocation point, *A*, *L* and *Gp* (about 1% of crossing-over), *Fs* (about 20%) and *R* and *Bt* (about 40%). In addition the following linkages in normal structural types are known or suspected: *A-L* (about 12% of crossing-over), *R-Bt* (about 30%) and *Fs-Gp* (about 42%). These three pairs of genes were formerly regarded as independent of each other in normal types, but evidence from the study of other interchanges now suggests that *A*, *L*, *R* and *Bt* are in the same chromosome and that *K*-line interchange occurred between this chromosome and the one containing *Gp* and *Fs* (i.e. chromosomes 1 and 2 respectively).

The genes *St*, *R*, *A* and *I* were also studied in interchange and normal types and new linkage data are presented. From the distribution in the pods of the different classes of phenotypes in  $F_2$  and in back-crosses it is shown that competition between the different classes of pollen tubes occurs. Evidence for selective elimination among the seeds is inconclusive.

663. CHAMBERLAIN, E. E. 635.656-2.8-1.521.6:575(93.1)  
**Varieties of garden and field peas immune to pea-mosaic.**

N.Z. J. Sci. Tech. 1939 : 21 : 178-83A.

The reactions of a large number of garden and field pea varieties to pea mosaic are tabulated. The need for an immune variety of the Greenfeast type is pointed out and an attempt is being made by the Agronomy Division at Lincoln, N.Z., to breed such a variety, using a mosaic-immune Greenfeast rogue as one of the parents.

## Part II. Foreign.

### STATISTICS 519

664.

519.24:631.421

Handledning i försöksteknik. (**The technique of field experiments**).  
Medd. Lantbrukshögskolan Jordbruksförsöksanstalten, Norrtälje 1939 :  
No. 1 : Pp. 207.

The reorganization of the official experimental work in agriculture in Sweden has, among other things, led to the desirability of a new publication by the State Agricultural Experimental Institute to take the place of the 1922 "Brief Guide to the Technique of Local Manuring Experiments". The result is the present publication, which is an extensive bulletin surveying the whole field, and incorporating modern knowledge relating to the design of field experiments and the statistical methods used in the interpretation of the results. The book, while primarily intended for those who are doing the field work, nevertheless incorporates sections dealing with the theoretical aspects of the subject, and thus forms a useful instructional manual for students. The treatment of experimental design is along the lines of the work of R. A. Fisher in this country. The various sections deal with—Design of Experiments—Field Arrangements—Local Manuring Experiments—Local Variety Trials—Experiments on the control of Weeds and Potato Blight, and Tilth Experiments—Experimental Equipment—Statistical Reduction of the Results. Fisher's table of the *t*-distribution and Snedecor's *F*-table are published in an appendix. Factorial designs are primarily recommended, and the description of the methods of Fisher and his collaborators is carried as far as the study of incomplete blocks involving confounding, and balanced incomplete blocks. Lindhard's row method is also described, and illustrative examples are provided. J. W.

665.

BATEN, W. D.

519.24:631.421

**Formulas for finding estimates for two and three missing plots in randomized layouts.**

Tech. Bull. Mich. Agric. Exp. Sta. 1939 : No. 165 : Pp. 16.

The author works out the formulae for calculating missing plot values in a randomized block experiment, previously done in general by Yates, for the special cases of two and three missing plot values. He differentiates between cases in which the missing values belong to the same block or treatment, or to different blocks or treatments, and in each case illustrates the nature of the calculation to be made. J. W.

666.

SALMON, S. C.

519.24:631.421

**The use of modern statistical methods in field experiments.**

J. Amer. Soc. Agron. 1940 : 32 : 308-20.

It is pointed out that statistical methods should always be applied to agronomic problems with a full realization of their limitations and of the assumptions which underlie generalized formulae. Failure to do this has in the past often led to mistakes being made. A particular point that is stressed is the danger of treating values obtained from experiments carried out in different years and at different stations as members of a single statistical population. As examples yield data obtained from Marquis and Thatcher wheats in rust years and rust-free years are given and also comparative yield data on Kanred and Turkey wheats over a period of 28 years.

Some of the limitations of pseudo-factorial designs are also stressed and it is suggested that when all the assumptions involved in this type of experiment have been realized and accounted for, much of their supposed gain in efficiency will be found to have disappeared.

667.

STOFFELS, A.

519.24:631.421

De berekening van middelbare fouten bij niet-homogene proefvelden.  
(**The calculation of the mean errors in non-homogeneous field plots**).

Landbouwk. Tijdschr., Wageningen 1940 : 52 : 165-74.

This paper describes three methods of calculating the standard error of the mean of a series of numerical quantities derived from field plots when these are arranged in a row and column formation. The first takes no account of possible fertility variations between rows and columns; the second, by considering deviations from row and column means according to the method of analysis of variance, gives a modified formula, in which due account is taken of the

reduction in the number of degrees of freedom; the third method depends on calculating first the differences between adjacent plot values in the same row, and second the adjacent column differences of the differences first calculated.

J. W.

## BREEDING 575

668. PINCUS, J. W. 575:575.11(47)  
**The genetic front in the U.S.S.R.**  
 J. Hered. 1940 : 31 : 165-68.

An account of the recent genetic controversy between the more conventional geneticists in the U.S.S.R. and those who discount the theories of Mendel, Morgan and Johannsen and believe that the influence of environment is paramount. Most of the paper consists of translations of summaries from Russian journals.

669. H. ...., A. 575:633(43)  
**The aims of plant breeding in German agriculture.**  
 Int. Rev. Agric. 1940 : 31 : T119-23.

The contributions of the plant breeder to the campaign for agricultural self-sufficiency in Germany are outlined. Supplies of oils and fats, proteins and textile fibres are seriously deficient and a number of new crops are being tried. The cigarette tobaccos bred at Forchheim produce seeds that are rich in oil and this may be refined and used as a foodstuff. *Lupinus albus* and *L. mutabilis* produce seeds with an oil content of 8% and 15-16% respectively and attempts are being made to acclimatize them. Varieties of soya bean that will ripen regularly in Germany are also being sought and one such variety has already been obtained. With regard to sources of protein, work on alkaloid-free lupins is outstanding, and yellow and blue flowered forms have been on the market since 1934. Forms with non-splitting pods have been selected and further breeding work to increase yield, earliness, etc. is in progress. Red clover and lucerne are also being bred.

Work on textile fibres includes flax improvement. The yield of fibre is being increased and by crossing with varieties grown for oil, fibre-yielding flaxes with enhanced oil yields have been obtained. Hemp improvement has chiefly been in private hands. An attempt to develop hermaphrodite varieties is being made, but the main aim is to produce varieties with increased yield of fibre and bearing ripe seed. The common nettle is also being developed as a fibre crop and forms which yield 750 1,000 kg. of fibre per hectare have been obtained. This crop, like the lupin, can be cultivated on poor soils.

Work on carbohydrate-yielding crops also continues. The immediate aim of rye breeding is to produce self-pollinating varieties that can be bred in the same way as other cereal crops. The baking quality of winter wheats is receiving attention and yellow rust resistance is also important. No further extension of the area under wheat seems possible, but the cultivation of wheat-rye hybrids may be possible on the poorer land.

Feeding barleys that are winter-hardy are being sought but no native or introduced barley has proved sufficiently hardy to withstand a severe winter in north-eastern Germany. Malting barley may in part be replaced by four-rowed feeding types, but work on new malting varieties is being carried out, the aims being high extract percentage and resistance to disease.

Potatoes are a very important crop and interspecific hybridization is being carried out to produce forms resistant to *Phytophthora*, Colorado beetle, virus diseases and frost.

670. \*LAMPRECHT, H. 575:633(48.5)  
 Arbetsplan för Weibullsholms Växtförädlingsanstalt för år 1940. (**Programme of work for Weibullsholm Plant Breeding Institute for the year 1940**).  
 Weibulls III. Årsb. 1940 : 35 : 5-26.

This report contains full details of research on cereals, legumes, potatoes, root crops and other vegetables as well as fruits and a note on variety trials with soya beans, millet, maize and poppies.

Experiments with colchicine treatment of beans, peas, cucumbers, onions, white cabbage, radishes and lettuce are also being conducted.

---

\* An extended summary of this paper is on file at the Bureau.

671.

575:633(49.2)

Zestiende beschrijvende rassenlijst, opgemaakt ingevolge de beschikking van den Minister van Binnenlandsche Zaken en Landbouw van 21 October 1924, gewijzigd 28 Maart 1933. (**16th descriptive list of varieties, drawn up in pursuance of the Order of the Minister of Internal Affairs and Agriculture of the 21st October, 1924, amended 28th March, 1933**). Inst. Plantenveredeling, Wageningen 1940 : Pp. 245.

Another issue of this excellent compendium for the use of breeders and growers of economic crops. Over 361 varieties and strains are described with valuable comments and information embodied in the introductory sections on various crops. The cross-referencing again is admirable and Professor Broekema's appeal in the appendix should ensure active co-operation from farmers, breeders and other users of the manual. (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 975.)

672.

575:633(49.3)

La Station de Recherches pour l'Amélioration des Plantes, de Gembloux (Belgique) 1913-1939. [**The Research Station for Plant Improvement, of Gembloux (Belgium) 1913-1939**]. Gembloux 1939 : Pp. 14.

A historical outline of the work and achievements of this Station created in 1913 for (1) the production of improved varieties specially adapted to various regions in Belgium and (2) research on genetics and plant breeding.

The scope of the activities of the Station is reflected in the analysis of the methods employed in its work, namely: pedigree selection; fixing of new types obtained by hybridization; comparative trials; the maintenance of purity of varieties and of supplies of pure seed; observations on variants of possible value as new types; collection of varieties, races or lines of selection as possible sources of new material for crossing; studies of the adaptation of various strains and popularization of improved varieties; and scientific researches of wide range applicable to plant improvement and genetics—the results of these investigations are published in the Journal of the Station which is regularly reviewed in "Plant Breeding Abstracts".

Among the varieties and strains of cereals that have been bred by the Station from time to time are: Wheat: Institut de Gembloux 18.102, Hybride du Jubilé, Professeur Delos (or Line 0), Line 61 and Précoce de Gembloux 134; Oats: Lines 979, 834 and 19; Barley: Lines 456, 125, 125.49, 185, 185.79 and 006 (six rowed).

Spelt improvement aims at increased yield and resistance to lodging.

Flax and tobacco improvement have been included in the work of the Station since 1931 and 1932 respectively.

673.

WAHLEN, F. T.

575:633(49.4)

Bericht über die Tätigkeit der Eidg. landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon für die Jahre 1934-1938. (**Report on the activity of the Confederate Agricultural Experiment Station of Zürich-Oerlikon for the years 1934-1938**).

Landw. Jb. Schweiz 1940 : 54 : 271-357.

The report on research during the period 1934-1938 includes the following information of interest to plant breeders:—

Following the provision of a laboratory for quality tests of bread cereals, the improvement of quality, in addition to earliness, high yield and reliability, has been included in the cereal breeding programme.

Potato variety trials are in progress and any changes in the standard variety collection in Switzerland must be based on results of such trials. Wild *Solanum* species are being used in crosses and it is hoped that good results may be obtained, especially in regard to resistance to *Phytophthora*, Colorado beetle and just possibly also to virus diseases.

Variety trials with mangels have been completed and a series with swedes begun.

Cereal crops are for the time being receiving most attention as regards breeding, though fodder and root crop breeding is to be developed later as soon as facilities are available.

The old land forms have been used as the basis of barley improvement by selection and by hybridization, and some promising varieties have been retained. The main difficulty has been to combine earliness in high yielding types with resistance to lodging under large scale conditions.

After 30 years of selection of Swiss land varieties of wheats, which are remarkable for their cold resistance, good grain quality and earliness, the possibilities of this method have been exhausted and it is now necessary in breeding winter wheats to eliminate the defects of low resistance to lodging and rather loose glumes by crossing with the Dickkopf or Squarehead type. Spring wheat improvement has been based much less on Swiss land varieties than on foreign varieties. No great success has been obtained so far and only one German Swiss variety, Wagenburger (which has, moreover, only a limited distribution) has been evolved.

Strains of proprietary varieties of spring wheat are grown at the Institute and steps are taken to ensure that the most popular varieties remain pure.

Attempts to produce (1) high yielding spring barleys resistant to lodging and suitable for fodder and (2) spring barleys for malting have not met with much success, the main defects in the fodder types being inadequate resistance to lodging and to loose smut.

In the production of the three varieties Adliker, Lenzburger and Rothenbrenner rye the Oerlikon Institute has taken a major part and proprietary strains and breeders' seed are now being raised under its direction. In all three varieties greater uniformity is aimed at, shape of ear and grain, colour of grain, and stem length being regarded as of special importance. In order to introduce high yielding capacity and resistance to lodging into these three Swiss varieties (which are satisfactory as regards quality and winter-hardiness) crosses with suitable foreign varieties will have to be made.

Studies of the effects of mass selection upon hybrid populations are being continued.

Observations have been collected for a description of the Swiss spelt varieties -which should prove useful in selecting parents for crossing. The study of the European spelt regions was continued and the material collected, consisting of about 200 samples from 7 large areas (comprising about 1,000 different spelt forms) is being compared in plots at the Institute. The collection is probably the most varied in existence.

Oat breeding operations are confined to the maintenance of the purity of the two Swiss varieties Adliker and Rosegg.

Inbreeding of the most important Swiss varieties Linth, Rheintaler and Nostrano maize and of the yellow Baden variety was continued and some of the 30 strains have been inbred in the fifth generation to detect undesirable strains.

Quality tests of cereals have been conducted not only as regards baking and milling but also in order to compare the different varieties; and some useful wheats for hybridization were found. The applicability of the technique of quality estimations for wheat to rye and spelt was also examined.

The description of the German-Swiss wheats having been concluded, the preliminary steps for a descriptive study of *Triticum Spelta* varieties in Switzerland was begun.

Inheritance studies of leaf variegation in rye and of the varietal characters in spelt were made. Clover breeding was also begun.

674. FUNCHESS, M. J.

575:633(73)

**Agronomic problems of the South.**

J. Amer. Soc. Agron. 1940 : 32 : 96-106.

Among the problems of importance in the south United States that are outlined, the improvement of crops by breeding takes a prominent place. Apart from forage crops, the following are the main breeding problems indicated: the production of disease-resistant peanuts, of a strain of the Alabama or North Carolina runner type which matures three or four weeks earlier than the varieties now available, and of types with high oil content and freedom from shattering; the breeding of rust-resistant oats and of oats with straw stiff enough to withstand thunderstorms; the development of high-yielding maize varieties with a husk long and tight enough to protect the ear from weevils and ear worms; and further efforts to combine high yield and high quality in cotton especially in the wilt-resistant types.

675. HAGEDOORN.

575:633:578.08

Het tusschenschakelen van extra wintergeneraties bij de plantenveredeling.

(**The insertion of extra winter generations in plant improvement**).

Erfelijkheid in Praktijk, Leiden 1940 : 5 : 199-200.

Various means of obtaining two or more (according to the crop) additional generations of plants in one year as material for subsequent crossing or selection are discussed, with brief observations on the results already obtained at French, Canadian, Swedish and German

institutes by such methods. Advice is offered on their economic value in large and small scale operations in plant improvement.

676.

575:633:581.162.52

581.162.52:575.11

ATWOOD, S. S.

**Self- and cross-sterility and fertility. Papers presented on "Improvement of naturally cross-pollinated plants".**

Amer. Soc. Agron., Crops Sect. Prog., Sub-Sect. I, Washington, D.C.

November, 1938 : 14-23. (Mimeographed).

The three main types of self-incompatibility mechanisms so far discovered in plants, the simple personate oppositional factor type, the *Capsella* type of Riley (1936) and the associate type best exemplified by Kakizaki's results with cabbage (cf. "Plant Breeding Abstracts", Vol. I, Abst. 146), are described at some length.

The importance of a detailed genetical knowledge of sterility relationships as a basis for breeding cross-fertilized plants is stressed. Such knowledge will enable the breeder to decide on the most promising breeding method for such a crop and whether, for instance, to inbreed by self-fertilization or whether to proceed by brother-sister mating to build up self-sterile inbred lines for the production of new synthetic strains by intercrossing. The male-sterile character common in grasses should also be investigated genetically, since it may in some cases be useful as an aid to crossing inbred lines on a large scale.

677.

WINTER, F. L.,

PIERCE, W. H. and

SCOTT, G. W.

575:635(73)

**Research and the vegetable seed industry.**

West Cann. Pack. 1939 : 31 : No. 12 : 11-12, 46.

A brief account of American research on the control of seed-borne plant diseases, on the development of disease resistant varieties and of varieties suitable for the quick freezing process.

## GENETICS 575.1

678.

TATARINTSEY, A. S. and

SILANT'EV, I. G.

575.1

**(I. V. Michurin's relationship to Mendel's "Laws").**

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 1 : 11-14.

Reference is made to Michurin's view that only those characters are expressed whose development is favoured by the conditions of growth of the young hybrid and that this explains the phenomenon of dominance; that dominance can be changed by varying the environmental conditions; that the influence of the environment on a hybrid is greatest in the young stage and is inherited; that to avoid dominance of the characters of one parent in a cross the two parents should be chosen from regions of entirely different environments, neither of which resembles that of the place where the breeding is carried out; and that true Mendelian segregation occurs only exceptionally, when there is no change of environment either for the parent or the hybrid plants. The relative heterozygosity of so-called pure lines is emphasized and it is pointed out that even in such classic crosses as those between pea varieties segregation occurs in the  $F_1$ . Finally, the selective action of gametes is referred to as refuting Mendel's law of independent recombination.

679.

575.1:001.4

576.356.2:001.4

**The symbolizing of genes and of chromosome aberrations.**

J. Hered. 1940 : 31 : 27-28.

A note similar to that referred to in "Plant Breeding Abstracts", Vol. X, Abst. 327.

680.

575.1:633

575:633

ZAYAS y MUÑOZ, F. de

**Qué es la genética y cuál su aplicación práctica a la agricultura. (What is genetics and what its practical application to agriculture).**

Rev. Agric., Habana 1939 : 22 : No. 7 : 103-10.

A popular explanation is given in Spanish of the principles of genetics and examples are cited of its use in plant improvement.

681. GENTCHEFF, G. and GUSTAFSSON, Å. 575.11:578.08  
576.3:578.08  
**The cultivation of plant species from seed to flower and seed in different agar solutions.**  
Hereditas, Lund 1940 : 26 : 250-56.

It was found possible to grow sterilized seeds of *Pisum* and *Spinacia* to maturity in a nutrient agar of the type devised for the culture of excised roots, even in complete darkness. Experiments in which colchicine and various auxins and hormones were included in the agar were also tried. The cultivation of barley, wheat and onions in these conditions failed owing to the difficulty of effecting proper sterilization of the material. Only early varieties of peas produced flowers readily in these conditions, and one variety, Extra Rapid, formed buds in 21 days.

It is suggested that this method of culture could readily be applied to studying the effect of various nutritive conditions and of various hormones, etc. on the sex balance in dioecious plants and on meiosis, to the rapid detection of transgressive segregates for earliness from crosses, and to the raising to maturity of chlorophyll-deficient and albino mutant types.

682. SCOTT-MONCRIEFF, R. 575.11.061.6:581.192  
**The genetics and biochemistry of flower colour variation.**  
Ergebn. Enzymforsch. 1939 : 8 : 277-306.

This is an exhaustive review of the present state of our knowledge of the chemistry of flower pigments and the chemical effects of the various genes which determine flower colour, a study to which the author has contributed much. The studies on *Primula sinensis*, *Streptocarpus* and *Dahlia variabilis* carried out at the John Innes Horticultural Institution are dealt with at some length.

683. BONNIER, G. 575.114:575.41:519.271.3  
Cangiamenti di frequenza dei geni nell'allevamento di popolazioni. (**Change of frequency of genes in the improvement of populations**).  
Scientia Genetica 1939 : 1 : 282-89.

In cross-fertilized plants such as beet it is important, the author points out, to know the minimum number of individuals from which seed must be taken in order to reproduce the essential characteristics of the population. On the basis of an analysis of a population resulting from free crossing between 100 males and 100 females containing 22 given genes in various frequencies, it is concluded that, even with a selection pressure of 0.1, such a number of individuals is sufficient to maintain the proportions of these genes in the resulting population.

684. SIDKY, A. R. 575.12:001.4  
**Symbols for backcross and backcross generations.**  
J. Hered. 1940 : 31 : p. 8.

A scheme for symbolizing back-crosses, repeated back-crosses and their progeny is put forward in two forms, one using ordinary type and the other special symbols.

685. STUBBE, H. 575.24:581.04  
Nährstoffhaushalt und Mutabilität. (**Nutrient economy and mutability**).  
Forsch. Fortschr. dtsch. Wiss. 1939 : 15 : p. 189.

The progeny of *Antirrhinum* plants grown under nitrogen, phosphorus or sulphur deficiency showed a marked increase in mutation frequency. When all elements were deficient however no such increase in mutation was observed, nor was it in the progeny of the smallest, obviously under-nourished capsules. The effect would seem to result therefore from a disturbance of the balance rather than from mere deficiency.

The progeny of some of the worst affected plants was less mutated than that of plants less severely damaged; this is thought to be due to the fact that the extreme mutants are inviable, which is borne out by the fact that pollen from badly affected plants when used to pollinate normals produced no mutant offspring.

686. MEIJERE, J. C. H. DE 575.4:576.12  
Heeft Darwin afgedaan? (**Is Darwin finished with ?**)  
Vakbl. Biol. 1940 : 21 : 146-48.

A defence of Darwin and his contribution to the theory of evolution with an explanatory note by v. d. Klaauw whose comments in a previous article called forth de Meijere's defence.

687.

SINSKAJA, E.

576.12

576.16

(What is a centre of species formation from the viewpoint of Ch. Darwin's theory ?)

Priroda (Nature) 1939 : No. 11 : 51-58.

POLJANSKIJ, V. I.

[Antidarwinism in the native country of Darwin. (The recent work of Prof. Punnett)].

Ibid 1939 : No. 11 : 87-96.

The eleventh number of the journal Priroda [Nature] for 1939 is dedicated to the eightieth anniversary of the publication of Darwin's "The Origin of Species" and contains a number of articles on various aspects of Darwinism. These two are of the most immediate interest to plant breeders.

Sinskaja's study of the distribution of species in *Medicago* and *Onobrychis* shows that starting from the centre of diversity and passing outwards along the radius of migration of the species, a species or ecotype characteristic of one zone is never repeated in another; this situation lends support to Darwin's monophyletic view of the origin of species.

In its migration from the centre each species undergoes a gradual alteration, corresponding closely with the ecological conditions of the areas through which it passes. The conditions in the centre itself may change, leading to the elimination of the original and bridging forms, thus giving rise to uncertainty as to the actual centre (e.g. *Brassica campestris*).

The characteristic feature of the centres of diversity is not so much the great variety of forms they contain as the intensity and diversity of the process of form development, which assumes different directions in accordance with the character of the environment, the existence of isolation barriers and the possibilities of hybridization between forms. In all these respects high mountain regions are said to be most favourable for the processes of form development. These processes have been favoured in the Caucasus also by the frequent volcanic eruptions creating new areas for colonization, free from competition, by old existing species such as *Medicago hemicycla*, which have effloresced into a series of new species and forms. The changed and improved climatic conditions seem to have led to the luxuriant specific development of the East Asiatic group of *Brassica*, where the absence of isolation has led to the formation of a secondary series of species, but with no sterility barriers between them.

V. I. Poljanskij refers to a recent article by Punnett, whose views on the discrete nature of both mutations and species, together with much of his other evidence opposing the Mendelian to the Darwinian views, are held to be out of date. Punnett's statement that natural selection does not create but merely selects is said to be antidarwinian and hence fallacious, based on a misunderstanding of Darwin's doctrine.

688. SIRKS, M. J.

576.16:582:576.356

**The genetic nature of racial and specific differences.**

Boll. Soc. Ital. Biol. Sper. 1940 : 15 : 184-90.

The author regards a species as consisting of "all individuals which possess a morphologically identical chromosome set and which by mutual matings produce an offspring which does not show any abnormal phenomena in the reduction division". A species defined on these lines may be divided into sub-species according to plasmatic differences and into varieties according to gene differences.

Forms not included in a species according to the above definition are classified as "hybrids" or, if they are habitually asexually propagated, as "clones".

### CYTOLOGY 576.3

689. SATÔ, D.

576.312:575.17

**(Chromosome structure and genes. Parts I and II).**

Bot. and Zool. 1936 : 4 : 1925-32, 2077-86.

A survey is presented for Japanese readers of important contributions that have been made to the theory of chromosome structure. The subject is dealt with under the following heads: Primary and secondary constrictions and satellited chromosomes; euchromatin and heterochromatin; chromosome structure changes and crossing-over; the chromonema—its structure and the phenomena pertaining to spiral formation; karyoplasm and cytoplasm and their interaction; and the physiological aspects of gene manifestation in the phenotype.

690. WULFF, H. D. 576.312.35:633.2/3  
Chromosomenstudien an der schleswig-holsteinischen Angiospermen-Flora.  
IV. (Studies of the chromosomes of the angiosperm flora of  
Schleswig-Holstein. IV).  
Ber. dtsch. bot. Ges. 1939 : 57 : 424-31.

Chromosome numbers are given for members of the *Polygonaceae*, *Cruciferae*, *Rosaceae*, *Leguminosae*, *Umbelliferae*, *Cornaceae*, *Pyrolaceae*, *Labiatae*, *Compositae*, *Juncaginaceae* and the *Gramineae*. Among the species included in this study were *Elymus europaeus* L. ( $n = 11$ ), *Trifolium agrarium* ( $2n = 14$ ), *Vicia cassubica* ( $2n = 14$ ) and *Lepidium campestre* R. Bv. ( $2n = 16$ ).

691. SINKE, N. 576.356:581.032  
576.356:635.651  
Experimental studies in cell-nuclei.

Mem. Coll. Sci. Kyoto 1940 : 15 : Ser. B : 1-126.

An extensive study of the structure of living nuclei and of the effects on them of dehydration, high and low temperatures, chemical treatment, etc. is reported.

External agents such as hypertonic solutions, abnormal temperatures, mechanical injuries, chloral hydrate and an aqueous extract of coal tar were found to cause various mitotic abnormalities in *Vicia Faba*. These were grouped into two classes, the first consisting of the occurrence of chromatin bridges, chromosome coalescence, the formation of binucleate cells and of tetraploid giant nuclei, etc. and the second of chromosome scattering, irregular chromosome distribution at anaphase and the formation of micronuclei. The first group of phenomena are believed to be due to dehydration and the second to hydration.

Evidence is presented in favour of the hypothesis that the occurrence of polyploidy in nature is due to dehydration.

692. SCHWANITZ, F. 576.356.5:576.16  
Polyploidie und Phylogenie. (Polyploidy and phylogeny).  
Biologie 1939 : 8 : 323-35.

Polyploidy and phylogeny were apparently unrelated subjects until the realization of the importance of mutations in evolution. A brief review of some of the more outstanding examples of polyploidy in plants indicates how new varieties and species may arise, often adapted to a new range of climatic conditions.

693. STRAUB, J. 576.356.5:578.08  
Die Erzeugung von Blütenpflanzen mit verminderter Chromosomenzahl  
(Hypodiploide). [The production of flowering plants with reduced  
chromosome number (hypodiploids)].  
Ber. dtsch. bot. Ges. 1939 : 57 : (155)-(174).

Using *Gasteria trigona*, *Galearia candicans* and *Lilium candidum* hypodiploid forms were obtained by X-ray irradiation of the zygote, pollen and pollen tube and by heat treatment of the pollen. The implications of the results in facilitating directly or indirectly attacks on problems of more general significance are indicated.

694. HAVAS, L. J. 576.356.5:581.04  
A colchicine chronology.  
J. Hered. 1940 : 31 : 115-17.

The author draws attention to papers relating to the cytological effects of colchicine which be published before the appearance of the well-known paper by Blakeslee ("Plant Breeding Abstracts", Vol. VIII, Abst. 771) and also to an early record of the induction of polyploidy in *Allium* by colchicine treatment (P. and N. Gavaudan and N. Pomriaskinsky-Kobozeff, March, 1937). He also summarizes some of his later work on the effects of colchicine and on the similarity of these effects to those of various hormones.

695. SHMUCK, A. and 576.356.5:581.04  
GUSSEVA, A.  
Polyploidogenic action on plants of naphthol ethers and naphthoic  
acid esters.  
C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 26 : 460-63.

Continuing the researches summarized in "Plant Breeding Abstracts", Vol. X, Abst. 352,

the authors tested the action of a series of esters of naphthoic acids and of ethers and esters of naphthols with respect to their activity in inducing polyploidy.

The naphthoic acids (of both the  $\alpha$  and  $\beta$  series) and naphthols themselves all failed to induce polyploidy in plants. The esters of naphthols were also inactive, though some of their ethers were active, viz. the ethers of the  $\alpha$ -naphthol series involving alcohols of low molecular weight. The degree of activity decreased regularly from the ether involving methyl alcohol to those involving propyl and isopropyl alcohol, higher members of the series being inactive.

Esters of  $\beta$ -naphthoic acid were inactive. As to  $\alpha$ -naphthoic acid, its methyl ester was the most active and its ethyl and propyl esters somewhat less so, the corresponding butyl and isoamyl esters being quite inactive.

The esters of naphthoic acid were effective in inducing polyploidy in wheat, flax, vetch and *Nicotiana rustica*, a much wider range of plants than is the case with acenaphthene and many other substances.

Tests on certain other substances which proved inactive are also reported.

696. SHMUCK, A. and GUSSEVA, A. 576.356.5:581.04  
**Haloid derivatives of aromatic hydrocarbons and their polyploidogenic activity.**

C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 26 : 674-77.

The  $\alpha$ -monohaloid derivatives of naphthalene were much more active than naphthalene itself in inducing polyploidy. Similarly 5-bromoacenaphthene and 5-chloroacenaphthene were much more active than acenaphthene, though, surprisingly, 5-iodoacenaphthene was inactive. Various other haloid derivatives are also reported on.

697. GAVAUDAN, P. and GAVAUDAN, N. 576.356.5:581.04:576.356:633  
 Action sur la caryocinèse et la cytodierèse des végétaux, des isomères de l'apiol de Persil. (**Action of isomers of apiol from parsley on karyokinesis and cell division of plants**).  
 C.R. Acad. Sci. Paris 1940 : 210 : 576-78.

Apiol is not proposed as a substitute for colchicine and acenaphthene in practice—the study is interesting as a part of the biochemical study of variations in mito-inhibitory properties of cyclic hydrocarbon derivatives. Effects on the nuclear behaviour in *Triticum vulgare* were studied (cf. "Plant Breeding Abstracts", Vol. X, Absts. 353 and 356).

698. TANG, P. S. and LOO, W. S. 576.356.5:581.04:633  
**Polyploidy in soybean, pea, wheat and rice, induced by colchicine treatment.**  
 Science 1940 : 91 : p. 222.

Tetraploid plants of soya bean, pea, wheat and rice were obtained by soaking young seedlings in 0.05 to 0.1% colchicine solution. They showed the normal morphological characters associated with polyploids. Colchicine in lanoline films was also tried.

699. MUDRA, A. 576.356.5:581.04:633.11  
 Incercări in vederea obținerii de forme poliploide la grâu prin tratament cu colchicină. (**Experiments on the production of polyploid forms of wheat by colchicine treatment**).  
 Bul. Fac. Agron. Cluj 1939 : 8 : 264-68.

Various methods and degrees of exposure to colchicine treatment of wheat grains were devised. Some resulted in complete inhibition of growth of the seed; others resulted in the production of normal and abnormal plants.

Microscopic examination showed that severely damaged tissue consisted of large cells with several nuclei or with a large number of chromosomes.

700. NAVASHIN, M. S. and GERASSIMOVA, H. 576.356.5:581.04:633.913  
**Production of polyploids by administering colchicine solution via roots.**

C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 26 : 681-83.

An investigation of the reasons why shoots treated with colchicine and apparently tetraploid

in the early stages later become diploid was carried out and the conclusion reached that insufficient penetration of the tissues by the colchicine is the chief cause. Experiments were carried out with young plants of *Taraxacum koksaghyz*. Immersion of their roots in colchicine solution of sufficient concentration led to the regular induction of polyploidy and very few of the resulting plants were chimerical. Penetration of colchicine through the roots and up into the shoot seems to be very rapid and thorough.

The production of polyploid roots is regarded as a valuable method of obtaining polyploid plants of species which produce adventitious buds on the root system.

701. 576.356.5:581.04:635.65

WEICHSEL, G.

581.04:576.356.5:633.3

Polyploidie, veranlasst durch chemische Mittel. Insbesondere Colchicinwirkung bei Leguminosen. (**Polyploidy induced by chemical substances—especially colchicine effects in Leguminosae**).

Züchter 1940 : 12 : 25–32.

The work of numerous instigators who have used different chemical substances in attempts to induce polyploidy in various plant species is surveyed and the writer's own experiments with colchicine used for the same purpose are recorded in some detail and with special reference to technique and difficulties due to the different reactions encountered in different plant families. No polyploid forms of *Glycine hispida* or *Vicia sativa* could be obtained by the author with colchicine treatment.

702. 576.356.5:581.162.5:576.312.34

KOSTOFF, D. **Fertility and chromosome length. Correlations between chromosome length and viability of gametes in autopolyploid plants.**

J. Hered. 1940 : 31 : 33–34.

Continuing the argument of a previous paper (cf. "Plant Breeding Abstracts", Vol. X, Abst. 7), data are tabulated which show that autopolyploidy leads to a higher degree of sterility in plants with large than in those with small chromosomes, since the large chromosomes form more chiasmata and hence more multivalents. The figures given for the percentage of abortive pollen in autotetraploids are 4.1 for *Beta vulgaris*, 4.1 for *Taraxacum koksaghyz* (both with short chromosomes), 23.1 for *Nicotiana glauca* and 23.5 for *N. trigonophylla* (with medium chromosomes) and 46.6 for *Festuca pratensis*, which has long chromosomes.

## BOTANY 58

703. GAVAUDAN, P.,

GAVAUDAN, N. and

DURAND, J.-F.

581.04:576.353

Nouvelles considérations sur l'activité modificatrice de la caryocinèse et de la cytotidérèse exercée sur les végétaux par quelques hydrocarbures cycliques et leurs dérivés. (**New considerations on the modifying action upon karyokinesis and cell division exerted upon plants by some cyclic hydrocarbons and their derivatives**).

C.R. Acad. Sci. Paris 1940 : 210 : 114–16.

Some chemical considerations on the above type of reactions (in wheat) with special reference to the problem of selective action of various compounds on the processes of cell division. (Cf. "Plant Breeding Abstracts", Vol. X, Absts. 353 and 356).

704. BOAS, F. and

GISTL, R.

581.143.32:581.04

Über einige Colchicinwirkungen. (**On some effects of colchicine**).

Protoplasma 1939 : 33 : 301–10.

The various physiological effects of colchicine on plants (including various micro-organisms) are listed and a particular study made of some of the grosser effects on growth.

705. 581.162.5

KUHN, E.

581.162.5:575

Physiologie und Vererbung der Selbst-sterilität bei Blütenpflanzen.

(**Physiology and inheritance of self-sterility in flowering plants**).

Naturwissenschaften 1940 : 28 : 1–9.

Self-sterility is defined as the condition in hermaphrodite organisms in which, although both male and female gametes are functional, self-fertilization is unsuccessful.

In his fully documented analysis of the nature of self-sterility, the author discusses the sequence of events in the fertilization processes in self-sterility; the physiological basis conditioning self-sterility; the nature of the inhibitory substances preventing fertilization; the inheritance of self-sterility (with special reference to the work of Lehmann and Filzer, East, Correns and other investigators) and its significance in practical fruit culture. The bibliography includes key papers of older and more recent work as well as recent reports on special problems.

706. KNJAGINIČEV, M. I. 581.192:575.11:578.08  
**(The biochemical study of initial and hybrid material).**  
 Selektcija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 12 :  
 8-12.

Marked variations were observed between individual wheat plants in respect of protein content, which varied also from plot to plot. Similar variation was observed in other plants. A real estimate of the value of a line or a hybrid cannot therefore be obtained by determinations on a small number of plants but only by comparing curves of variation and observations taken over a number of years, with a large number of replications.

707. SHARDAKOV, V. S. 581.331.2:581.142:578.08  
**Reaction for peroxidase as an index of viability of plant pollen.**  
 C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 26 : 267-70.

A specific test for peroxidase which can be applied to pollen is described. A modified Nadi reagent is used and the grains containing peroxidase turn red. The method appears to be a much more accurate index of the percentage of germinable pollen than the common methods of staining with aceto-carmin or iodine.

708. WINKLER, H. 582:001.4:576.12  
 Die Notwendigkeit eines Zusammenfassungsverfahrens zur Überwindung der fortschreitenden Literaturzersplitterung und Unübersehbarkeit unserer Forschungsergebnisse. **(The necessity for a method of documentation to obviate the ever increasing scattering and difficulty of obtaining a synoptic view of our research results).**  
 Ber. dtsch. bot. Ges. 1939 : 57 : (128)-(138).

A development of the views expressed in the writer's paper on "Habit and Phylogeny" at the 6th International Botanical Congress (1935) in which the compilation of a synoptic list of all phylogenetically important characters of the angiosperms was urged together with various other reforms affecting phylogenetic taxonomy and botanical nomenclature. The synoptic list advocated would contain a section for genetics.

#### SEED PRODUCTION 631.531.12

709. PUKHAL'SKII, A. V. 631.531.12:633.1  
**(The production of élites at the Šatilovo State Breeding Station in 1939).**  
 Selektcija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 1 :  
 14-18.

The production of élite seed of a number of wheat, oats and millet varieties is described. Intravarietal crossing increased yield and winter-hardiness.

#### PLANT DISEASES AND PESTS 632

710. NIZENKOV, N. P. 632.111-1.521.6:633:578.08  
**(A new method for determination of cold resistance in winter plants).**  
 Proc. Lenin Acad. Sci. U.S.S.R. 1940 : No. 1 : 21-22.

The method involves the use of a small galvanometer whereby it is possible to determine the temperature at which the electromotive force in the plant entirely disappears. The results have accorded satisfactorily with direct tests of resistance.

711. WINGE, Ö. and LAUSTSEN, O. 632.422.3:575.14:576.311  
**On a cytoplasmatic effect of inbreeding in homozygous yeast.**  
 C.R. Lab. Carlsberg 1940 : 23 : Sér. Physiol. : 17-39.

*Saccharomyces cerevisiae* var. *ellipsoideus* shows considerable degeneration on inbreeding,

particularly when single-spore cultures diploidize immediately by fusion of the daughter nuclei of the germinating spore before the formation of any haploid daughter cells. Homozygous lines of this yeast may show further degeneration on inbreeding and to explain this it is suggested that the chondriosomes carry genetic determiners which influence vigour. *S. validus* shows no loss of vigour on inbreeding and it is supposed that the chondriosomes therefore divide at an earlier stage in the nuclear division. *Zygosaccharomyces Prioranus* also shows no inbreeding degeneration.

712. Góis, L. A. de Almeida. 632.422.3:575.42:634.37  
Leveduras seleccionadas para a indústria do álcool de figo. (Yeasts  
selected for the fig alcohol industry).  
An. Inst. Sup. Agron. Lisboa 1938 : 9 : 49-56.

Each type of fermentation requires special yeasts and the author has carried out experiments whereby it has been possible to select races suitable for the fermentation of fig juice, the comparative merit of the different races being based on the percentage of alcohol produced. For the best race this amounted to 10.26%.

713. NAUMOV, N. A. and 632.45:633.1(47)  
ZUBAREV, A. K. (Editors). 632.452:576.16(47)  
(The rusts of cereal crops).

Lenin Acad. Agric. Sci., published by Sel'khozgiz, Moscow 1939 : Pp. 286.

This is a collection of papers on the subjects dealt with at the First Pan-Soviet Conference on the Control of Cereal Rusts in 1937. It contains the following articles of interest to plant breeders:—

Vavilov, N. I. (*Breeding resistant varieties as the main method of  
controlling rust*). (pp. 3-20).

Emphasis is placed on the importance of physiological forms, which have been imperfectly studied in the U.S.S.R., in connexion with breeding for resistance. The varieties of wheat at present most extensively grown in Russia are susceptible to many of the most prevalent diseases, resistance to many of which can only be found in the tetraploid wheat species. Certain geographical groups of soft wheat are characterized by relatively high resistance e.g. the wheats of China, Canada, Australia and parts of the U.S.A.; the use of these is thought to be more advisable than crossing with distant species, though the production of Hope and Thatcher wheat is cited as an example of the successful use of interspecific crossing; other examples are the Saratov hybrids Sarrubra and Sarrosa, the various *Agropyron* hybrids and the hybrids with *Triticum Timopheevi*.

Syrovatskii, S. G. (*Results of the work of the Voroshilovsk Station for  
Rust Control in breeding grain crops for resistance to  
species of rust and smut*). (pp. 105-10).

The results of the author's observations on the reaction of a number of the commonest varieties, Soviet and imported, are reported. The American varieties Kanred x Fulcaster and Illini Chief are among the most promising and these, together with a number of others, have been crossed with Ukrainka. Rust-resistant hybrids have been obtained from Ukrainka x Marquis, forms resistant to brown rust and stem rust from Kanred x Fulcaster crossed with Ukrainka and a form resistant to brown rust from Ukrainka x Hussar. Among the spring wheats hybrids of Double Cross 1664 x Lutescens 062 have proved highly resistant to both brown and stem rust and relatively resistant to yellow rust; they are also distinguished by very large and heavy grains.

Rusakov, L. F. (*Rust of cereals and the problem of crop rotation*).  
(pp. 111-40).

In outlying a programme of breeding for resistance to rust and smuts recommendations of varieties most suitable as parents are made for the different cereals. The most promising of the new resistant hybrids bred at various stations are enumerated, with indications of the organisms to which they are resistant.

Gešele, E. E. (*Results of work on rust resistance of wheat carried  
out by the phytopathological laboratory of the Odessa  
Breeding and Genetics Institute*). (pp. 141-48).

In the conditions of Odessa *T. durum* forms have proved more susceptible than *T. vulgare* varieties to *Puccinia graminis* and *P. glumarum*, though they are more resistant to *P. triticea*.

The same difference has been noted between the hard and soft types segregated in crosses between the two species except that many of the *vulgare* type segregates are susceptible to all rust species; it is therefore thought more profitable to confine breeding work to crosses within *T. vulgare*, especially as many forms of this species resistant to *P. triticina* are now known. An extension of the study of physiological forms to those attacking other species than *T. vulgare* is thought necessary. The use of mature plant resistance in breeding is also recommended.

Zolotnitskii, V. A. (*Breeding spring wheat in the Amur region for resistance to rust*). (pp. 149-59).

Spring wheat hybrids resistant to black stem rust have been obtained from crosses involving Marquillo, Strube, Garnet and Albidum 0604. Especially good results have been produced by crossing Strube x Albidum 0604. The hybrid Lutescens 062 x Klein 33 is exceptionally early and has very strong straw. Promising hybrids have also been obtained from the interspecific crosses Lutescens 062 x *T. persicum* and *T. dicoccum* var. *farrum indicum* x *T. durum* var. *coerulescens* and a number of selections of local wheats have proved resistant.

Galeev, G. S. (*Breeding work with oats at the Kamenno-Steppe Experiment Station*). (pp. 160-62).

In 1925 crosses were made between Red Rustproof (*Avena byzantina*) and White Tartar (*A. sativa*). Twelve of the best lines were tested in 1932 and by 1935-36 the two selections 15/37 and 17/30 had proved themselves to be the most resistant to *P. coronata*, to have the largest grains and to be not inferior to the standards in husk percentage. Their grain is somewhat dark in colour and they are insufficiently drought-resistant.

714. FRANSEN, J. J. 632.951.1:575  
*Pyrethrum*. (*Pyrethrum*).

Tijdschr. Ned. Heidemaatsch. 1940 : 52 : 126-51.

The following points in this paper are of interest to plant breeders:—

One of the difficulties in *Pyrethrum* selection is the change in pyrethrin content from year to year in the same plant. The evidence on this point is however conflicting. No correlation appears to exist between any external character and pyrethrin content or yield of flowers, and even seedlings from élite plants offer very difficult material for the breeder. An experiment in progress has shown that mechanical harvesting is essential in Holland if the crop is to pay and mechanization necessitates selection for varieties with long stems and uniform flowering time—two points even more important than pyrethrin content in the writer's opinion.

### ECONOMIC PLANTS 633

715. HEINISCH, O. 633:575(43.71+43.72)  
Die Pflanzenzüchtung im Protektorat Böhmen-Mähren. (*Plant breeding in the Bohemia-Moravia Protectorate*).  
Mitt. Landw. 1940 : 55 : 11-12, 30-31.

A survey of the development, the present position and resources and the future trend of plant breeding in the Protectorate.

The breeding of malting barley has already given very good results as regards yield and quality, though still further improvements in quality could be obtained by co-operation between the breeders and the brewing and malting industries. The writer hopes that progress may be made in breeding for earliness by using the extremely early ripening North African barleys in hybridization.

In considering the geographical distribution of various types of wheat in the Protectorate the excellence of the grain quality of the Bohemian alternative wheats is emphasized and the improvement of yield and resistance to lodging and rust are specified as points for the breeder's special attention.

Rye cultivation in the region is represented by relatively few varieties, e.g., Lochows Petkus and Rümker rye.

In addition to the 23 oat varieties originally bred in the Protectorate and including Selecta, produced by the Nolz-Dreger Breeding Association and the Prerau Breeding Union, Swedish varieties are in great favour and have to a large extent replaced German oats. Some English varieties, in spite of their high price, have also found a ready market—a fact which is attributed by the author to active propaganda. The almost complete disappearance of German varieties from the register of certified seed is regarded as a regrettable loss to oat cultivation.

Maize breeding offers considerable scope for development. At present three breeder's varieties and one local type compose the approved collection available to growers. Breeding hybrid maize (begun in Moravia by Frimmel) is regarded as a promising avenue for future work. The present lack of seed could be met by using German varieties and especially Janetzki which is widely grown.

Beet breeding is well advanced and in addition to the universal E and Z types the Semtschitz Station (at Dobrowitz) breeds special types for export, e.g. a non-bolting and a maritime variety. Wild forms (*Beta lomatospora* and *B. trigyna*) are being used in hybridization though hitherto without practical results. The possibility of producing a winter-hardy sugar beet is being examined.

Fodder-beet breeding, a more recent development, is carried out particularly at the Selecta and Wischenau Stations at Kromau (Moravia). Many of the home produced types originated (as did also many of the potato varieties) from German material and German and Danish varieties are widely grown.

The potato collection of the region comprises 36 varieties and, though not all still on the German official certified register, an important rôle is allotted to the German forms in future developments in the Protectorate.

In the Protectorate legumes are represented by seven varieties of peas, two of field beans, one of lentils and one of soya beans. The last named crop was intensively bred but the varieties produced were formerly handed over to Slovakia. Soya bean breeding will again be actively carried on now.

There are three varieties of flax at present in the country and flax breeding is in progress at the Domaninek Research Station.

Vegetable breeding has not yet been developed to any great extent in the Protectorate as compared with pre-Anschluss Germany.

The general tendency in the future development of the region should be to reduce the number of varieties of cereals and increase the number of varieties of fodder and oil plants, vegetables and fibre plants too to some extent. Emphasis is laid on the importance of developing seed production to meet economic demands and it is hoped that Germany and the Protectorate could thus supply each other's needs.

716. 633-1.524(48.9)  
**Some prominent Danish varieties and strains of agricultural and horticultural plants, 1937.**

Seed Comm., Roy. Agric. Soc. Denmark 1937 : Pp. 7; Suppl. 1939 : Pp. 1.

This list of outstanding Danish varieties of crop plants includes references to the papers in which fuller details of each variety may be obtained. Samples of seed of each variety were at the time of writing available, free of charge, to those requiring them for experimental purposes.

717. 633-1.524(58)  
633.1:576.16:581.9  
575.3:581.13:578.08

Bericht über die dreiundfünfzigste Generalversammlung der Deutschen Botanischen Gesellschaft in Graz, August 1939. (**Report on the 53rd General Meeting of the German Botanical Society in Graz, August 1939**).

Ber. dtsh. bot. Ges. 1939 : 57 : (1)-(37).

Among the papers read at this meeting was an account of the 1935 German Hindu Kush expedition in search of primitive crop plants for use in breeding and especially with reference to disease resistance. R. Freisleben (Halle), [Pp. (15) (17)] dealt with the forms of barley and wheat found, the gene centres of these two crops and the significance of hybridization in the production of new forms. The most important characteristics of the wheats and barleys brought home by the expedition were described from the standpoint of their importance in breeding. (Cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1449).

H. Schander [Pp. (29)-(30)] also read a paper on the need for methods of determining the individual differences in nutritional physiology in different species in connexion with the problem of breeding crops for adaptation to particular soil conditions. Instances were drawn from the work at Müncheberg on lupins unaffected by lime in the soil, soya beans unaffected by alkalinity or acidity and a type of lucerne (*Medicago sativa*) unaffected by acidity. In the last named plant varietal differences in reaction were also mentioned.

718.

633.00.14:578.08

Handleiding voor veldproeven der Regelingscommissie voor het Landbouw-proefveldwezen te Wageningen. (**Manual for plot experiments of the Organizing Committee for Agricultural Field Experimentation at Wageningen**).

Meded. LandbvoorlichtDienst, Wageningen 1934 : No. 1 : Pp. 56.

In Part I comprising the introduction to this admirably compact and practical manual on the planning and execution of field experiments general considerations such as the particular aims and uses of different types of experimentation, the validity of such tests and its range are examined.

Part II deals with all practical aspects of the planning and execution of field experiments and the evaluation of their results.

Other subjects treated are:—Cooking tests of the quality of potatoes, methods of grass sampling for botanical or chemical examinations, reports, calculations, a system of registration of trials, convenient abbreviations and symbols (including the formula for some useful statistical concepts such as the mean error), a list of useful instruments and accessories required in field trials and a table for calculating the starch content of potatoes.

A table of contents concludes the booklet.

719.

HOEDT, T. G. E.

633.00.15(92.2)

Over proeven en het nemen van proeven in onze bergcultures. (**On experiments and the carrying out of experiments in regard to our plantation crops**).

Bergcultures 1940 : 14 : 2–14.

A full analysis of the relations that should exist between the functions of the central experiment station and the estates in Java in regard to the planning and execution of experiments and trials relating to rubber, tea and cinchona. The value of co-operation is emphasized and advice is given in the planning, conduct and interpretation of comparative trials for which various modern techniques are now available.

## CEREALS 633.1

720.

DRAHORAD, F. and

DIMITZ, L.

633.1–1.524(43)

Zur Verbreitung der Getreidesorten in der Ostmark, unter Berücksichtigung der geographischökologischen Verhältnisse. (**On the distribution of the varieties of cereals in the Ostmark with reference to the geographical and ecological conditions**).

Züchter 1940 : 12 : 9–16.

The need for the distribution of improved types (including land varieties) in the Ostmark is emphasized. Extensive purification of varieties and the marking out of areas for particular varieties call for active investigation. Previous literature on the subject is mentioned.

## WHEAT 633.11

721.

CIFERRI, R. and

GIGLIOLI, G. R.

633.11(49.9)

I frumenti di Rodi. (**The wheats of Rhodes**).

Relaz. Monogr. Agr.-Colon., Firenze 1939 : No. 57 : Pp. 20.

A study has been made of a collection of wheats from the island of Rhodes. They are all somewhat later in maturity than the variety Damiano Chiesa which was taken as standard; they are susceptible to rust and to lodging; they are very homogeneous in type, the most prevalent being *Triticum durum* var. *leucurum*, which is present in a number of forms, of which descriptions and illustrations are given. There are everywhere admixtures of *T. turgidum* and interspecific hybridization between the two appears to be frequent.

The Rhodes group is ecologically distant from other existing groups and is ascribed to a new *proles*.

722.

CIFERRI, R.

633.11(63)

Frumenti e granicoltura indigena in Etiopia. (**Native wheats and wheat cultivation in Abyssinia**).

Agricoltura Colon. 1939 : 33 : 337–49.

This is a reprint of the article referred to in "Plant Breeding Abstracts", Vol. IX, Abst. 1427.

723. MUDRA, A. 633.11:519.241.1:575.19  
Cercetări asupra raportului dintre însușirile elitelor și însușirile primelor descendențe la grâul de toamnă. (**Investigations on the correlations between the characters of elite plants and of their progeny in winter wheat**).  
Bul. Fac. Agron. Cluj 1939 : 8 : 1-8.

No correlations were found for quantitative characters determined in 119 elite plants (derived from 3 F<sub>2</sub> hybrid populations) and in their individual progeny—except in the case of 1,000 corn weight, which is not invariably a character of importance in breeding.

724. BERG, S. O. 633.11:575(48.5)  
Weibulls Åringvete III. Ny höstvetesort för södra och östra Götalands slättbygder. (**Weibull's Åring III wheat—A new variety of winter wheat for southern and eastern Götalan plains**).  
Weibulls III. Arsb. 1940 : 35 : 31-40.

As a new selection from the Åring wheat (produced in 1932), the variety Åring III has been put on the market in 1940. In numerous trials it has surpassed its parent variety to some extent in grain yield and markedly as regards hectolitre weight and has also done well in experiments with Åring II. Skandia surpasses it in grain yield but not in hectolitre weight and further tests will be necessary before the agronomic value of these two varieties is decided. Åring III has good baking quality and surpasses Åring II in loaf volume, earliness (ripening a few days sooner) and in strength of straw.

725. LAMB, C. A. 633.11:575(77.1)  
**Thorne wheat.**  
Spec. Circ. Ohio Agric. Exp. Sta. 1938 : No. 55 : Pp. 4.

Thorne is a new soft red winter wheat bred from the cross Portage (a selection of Poole) x Fulcaster by L. E. Thatcher in Ohio. It has outyielded the standard varieties by 2.3 to 3 bushels per acre in extensive trials. It is a beardless form with exceptionally stiff straw, has shown very little loose smut infection though it is not immune, and has good resistance to bunt. It is susceptible to leaf and stem rusts. In winter-hardiness and quality it is equal to the standard varieties.

726. BECKMANN, I. 633.11:575(81)  
633.11-2-1.521.6:575"793"  
El problema del trigo en el Brasil. (**The wheat problem in Brazil**).  
Rev. Fac. Agron. Univ. Montevideo 1940 : No. 19 : 21-36.

In discussing wheat breeding in Rio Grande do Sul the great success of the varieties Fronteira and Surpresa, resistant to yellow rust, produced from crosses of the local varieties Pollisu x Alfredo Chaves 6, is referred to; Fronteira is particularly productive and of excellent quality, for which reason it is still preferred to all other varieties. It has recently suffered from *Puccinia graminis* however and has been crossed with the Uruguayan variety Centenario. Some of the hybrids are very promising, combining high yield at a variety of different sowing dates, high hectolitre weight, excellent baking quality, and resistance to all three rusts, in all of which features the best of the hybrids have excelled Fronteira.

From a cross of Florence x Estanzuela, a variety named Floresta has been produced which is equal to Florence in earliness but free from the defect of sprouting in the ear. A still earlier form, Floreana, has been obtained from crosses of Florence with Mentana and is regarded as one of the earliest wheats in existence. Two complementary genes for earliness seem to be combined in this variety. The best early strains have come from the cross Fronteira x Mentana; they are referred to as the Frontana lines and are exceptionally productive and tolerant of late sowing.

727. SOKOL'SKII, D. P. 633.11:575:631.524  
(**The improvement of the local varieties of winter wheat in the Ivanovo region and the production of elites**).  
Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : Nos 10-11 : 17-22.

Descriptions are given of the local selections Sandomirka (which exists in various forms), characterized by great winter-hardiness; Vjaznikovskaja, a very promising hardy variety;

and Morozovskaja, which appears to be identical with the white form of Sandomirka. Yield figures presented show that all are superior to the standard variety Durable, indicating that the local wheats are the best for use as breeding material. Intra-varietal crossing has been carried out on Sandomirka.

728.

PALMOVA, E.

633.11:575.11

633.11:575-18

(Kind of inheritance of quantitative characters in hybridization of hard wheat).

Proc. Lenin Acad. Sci. U.S.S.R. 1940 : No. 1 : 10-13.

In crosses between the Russian standard varieties of *T. durum* and the Khoran group (var. *horanicum* Vav.) the characters of the latter are dominant or at least predominant. Many chlorophyll deficiencies occurred and transgressions in the direction of reduced number of spikelets and grains per spikelet were frequent. Many of the segregates showed increased drought and heat resistance and may prove of practical value.

The Russian forms when crossed with the Mediterranean group were again almost completely recessive. Transgression occurred in both directions in respect of number of spikelets per ear and chlorotic plants were very frequent. There also appeared forms earlier than either parent.

Hybrids between var. *horanicum* and the Mediterranean and Transcaucasian group were mainly intermediate, with transgression in certain combinations.

The Abyssinian forms crossed with the Russian and Mediterranean groups were dominant in most characters, transgression occurring for size of grain; sterility occurred in many of the hybrids.

The Arabian group crossed with the Khoran and Mediterranean forms were also dominant; one combination gave wide segregation of the interspecific type. Valuable early and high yielding forms appeared among the progeny of some of these crosses, some of the segregates having a thousand corn weight of 53 gm.

The Anatolian variety Reichenbachii No. 21104 when crossed with the Mediterranean types was dominant in nearly all its characters, though these are such as would be normally recessive—e.g. thin straw, small leaf, procumbent habit and small ear and grain.

The general type of inheritance in these crosses is analogous to that observed in crosses of *T. vulgare*.

729.

ALMEIDA, J. M. de.

633.11:575.11-181.12

Hereditariedade do comprimento das aristas da terceira flôr, no *Triticum vulgare*. (Inheritance of the length of the awns on the third floret in *T. vulgare*).

Agron. Lusitana 1939 : 1 : 394-400.

The third floret of the awned variety Lin Calel has awns, the average length of which is  $17.20 \pm 0.945$  [mm. ?]; in Vogtländer Braun, an awnless variety, such awns are absent. Segregation with transgression of the parental length occurred in the  $F_2$  of a cross between these two varieties; a correlation of  $r = 0.38$  was detected between length of the third awn and length of the lateral awns but is thought to be due to environmental rather than genetic influences. The average length of the awns of the third floret was 26.10% less in the  $F_2$  plants than in the awned parent, and this reduction is ascribed to the action of modifiers (cf. "Plant Breeding Abstracts", Vol. X, Abst. 385).

The cross Turkey x Crieuener 27 gave similar results, which were studied in more detail. The  $F_1$  was intermediate and a 1 : 2 : 1 ratio was observed in the  $F_2$ . A reduction of 10% was observed in the average length of the long awned group. The frequency distribution of the lengths almost corresponded to the binomial of  $(a + b)^7$  and the presence of 7 to 8 pairs of modifiers is assumed. These are apparently distinct from the modifiers for lateral awn length previously reported (*loc. cit.*).

730.

BABCOCK, E. B.

633.11:575.127.2

The chronology of Hope wheat.

J. Hered. 1940 : 31 : 132-33.

The author reproduces part of a letter from E. S. McFadden in which it is noted that Hope wheat was developed from a cross made in 1916 and was originally selected in 1920. Some authors have in error given 1930 as the date of the production of Hope wheat.

731. KASPARYAN, A. S. 633.11:575.127.2:576.356.5:581.04  
633.11:575.129  
**A new amphidiploid-einkorn x Persian wheat (*Triticum monococcum Hornemanni* Clem. x *Triticum persicum fuliginosum* Zhuk.).**  
C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 26 : 166-69.

An amphidiploid plant was obtained from the cross *T. monococcum* x *T. persicum* by cutting back the hybrid plants and treating the young primordia of the late tillers with colchicine in agar. Second generation amphidiploids were obtained and studied. They showed high fertility and a fairly normal meiosis; chiasma frequency was apparently somewhat reduced and in some cells there were univalents. Second division and tetrads appeared to be normal. The amphidiploid plants were larger than the parents, and approached *T. persicum* in ear type, though the ear was considerably denser. The grain was easily threshed and the rachis only slightly brittle. Rust resistance was high, though the plants were not immune.

732. GREBENNIKOV, P. E. 633.11:575.42  
**(The multiple mass selection as an agrotechnical method of increasing the yield of winter wheat).**

Ann. White Russian Agric. Inst., Gorki 1939 : 10(32) : 1-12.

Selection of the largest grains from the central ear of the best plants led to marked improvement in yield, in size of grain, rust (*Puccinia triticina*) and frost resistance. The effect increased with each successive generation of selection, being more pronounced in some varieties (referred to in the text as "pure lines") than in others.

733. KAKHIDZE, N. T. 633.11:576.312.34:576.356.2  
**Chromomere structure of mitotic chromosomes in wheats.**  
C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 26 : 468-70.

The chromomere structure of the two pairs of chromosomes possessing appendages was studied in *Triticum durum* var. *melanopus* and *T. durum* var. *gondaricum*. One pair had a similar structure in both varieties, while the other pair differed in the structure of the arm without the secondary constriction, this arm having been involved in a reciprocal interchange (cf. "Plant Breeding Abstracts", Vol. X, Abst. 398.)

734. VOGEL, O. A. 633.11:581.148:631.521.6:519.241.1  
633.11:575:578.08

**Studies of the relationships of some features of wheat glumes to resistance to shattering and of the use of glume strength as a tool in selecting for high resistance to shattering.**

Res. Stud. St. Coll. Wash. 1939 : 7 : 199-200. (Abst.).

The amount of mechanical tissue in the basal portions of the glumes of a series of wheat varieties was found to be related directly to freedom from shattering. Mass determinations of the amount of mechanical tissue, were, however, impracticable and a study was accordingly made of the relation between glume strength and resistance to shattering. These characters were positively correlated among varieties which had similar morphological characters, particularly of the ear. Club and the dense portions of squarehead ears were less prone to shattering at any given glume strength than lax ears or portions of ears. Wide variation in glume strength between ears of the same sample makes adequate sampling important.

Data gathered from ears at the late milk stage of growth were not significantly different from those gathered at maturity.

Data obtained from  $F_2$  progenies were inadequate for a study of the mode of inheritance of glume strength.

735. MIÈGE, E. and COURTINE, J. 633.11:582:578.08  
**Méthodes de diagnose spécifique dans le genre "*Triticum*". Application à l'identification de quelques blés intermédiaires. (Methods of species diagnosis in the genus "*Triticum*". Application to the identification of some intermediate wheats).**

4th Congr. Fed. Soc. Savantes Afr. N. Pp. 37.

Critical considerations on various methods and characteristic features that may be used in

endeavouring to identify forms such as speltoid, durelloid, tendroid and other intermediate types of wheats which may be difficult to classify.

In presenting his problem the author has consulted over 71 references in various languages.

736. 633.11-1.524(43.6)

MAYR, E.

633.16-1.524(43.6)

Sortenfragen und Sortengebiete in der Ostmark. (**Variety questions and variety zones in the Ostmark**).

Angew. Bot. 1940 : 22 : 86-97.

In many parts of the Ostmark the cereals are at the limit of their area of possible cultivation and provide valuable material for breeding varieties designed for other such regions. The alpine zone is a gene centre and the land races of wheat and barley contain a wealth of forms, many of extreme antiquity that are unknown elsewhere. Many forms of *Triticum compactum* show marked resemblances to the wheats of the Swiss lake dwellings and have a very thin skin. The winter wheats are of very high baking quality. Primitive characters have been observed also in the spelt wheats and six-row barleys. The particular value of these forms for breeding lies in the fact that they are so admirably adapted to local conditions.

737. LI-YING SHEN 633.11-1.524(51)

(**Breeding of the National Research 28 wheat**).

Special Publication of the National Agricultural Research Bureau, Szechuan 1939 : No. 21.

The variety now named National Research 28 is the Italian type Villa Glori, a form of *Triticum vulgare* var. *multurum* bred by Strampelli. It has been under test in China since 1931 and has stiff straw, good tillering capacity and heavy yield. It meets the needs of Szechuan Province (where lodging is usually serious) better than any other variety so far tested. It is rather resistant to leaf rust and stripe rust and slightly susceptible to scab and loose smut.

738. CIFERRI, R. 633.11-1.524.4(63)

La cerealicoltura in Africa Orientale. V. Complessità del problema frumentario e prospettive di produzione. (**Cereal cultivation in East Africa. V. The complexity of the wheat problem and the prospects of production**).

Ital. Agric. 1940 : 77 : 31-42.

All the populations grown, in addition to containing 6 to 7 different species, are exceedingly mixed as regards the sub-groups and forms, as has now been shown by applying the phenol test. The proportion of the different species and forms varies in different zones and appears to be a function of the ecological and edaphic characteristics of the different localities. It varies also according to the season, and although a distinct improvement in yield can be obtained by removing the inferior types from the populations it is not thought advisable to select absolutely pure strains.

739. ŠEVČUK, T. N. 633.11-2-1.521.6:575(47)

[**A new promising variety of winter wheat (Ul'janovka)**].

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 1 : 29-30.

The variety has been produced by selection from "Belokoloska Bezostaja" [Awnless White-Ear]; it is highly frost-resistant, in which it excels even *Lutescens* 0329, which it exceeds also in earliness by 2 to 4 days. It is free from shedding and resistant to drought, brown rust and smuts. The grain is large, red and vitreous and is of high baking quality. An excess of yield of up to 6.8 centners per ha. over the standard Durable has been registered.

740. SALTYKOVSKY, M. I. and 633.11-2.111-1.521.6:575(47)

SAPRYGUINA, E. S.

581.143.26.03:633.11

**On selecting pairs in crossing and breeding winter hardy wheat.**

C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : 25 : 766-69.

The authors deduced on physiological grounds that transgressive segregation for frost resistance would be expected in crosses between wheats which differ widely in the relative lengths of their vernalization and light stages. To test this, crosses were made between the spring wheat *Milturum* 321 (short vernalization and long light stage, usually killed at  $-10^{\circ}\text{C}$ ) and the winter wheat *Kooperatorka* (long vernalization and short light stage, usually killed at

—16° or —17° C). Selection in  $F_2$  and  $F_3$  resulted in the production of  $F_4$  lines which exceeded both parents in frost resistance, 11 tested lines showing from 11 to 100% survival at —20.5° C. Similar results were obtained in other crosses. Some of the lines proved resistant to damage by high temperatures as well as frost.

741. MILAN, A. 633.11-2.451.2-1.521.6:575(45)  
Sensibilità per la *Ustilago tritici* (Pers.) Jens. di alcuni ibridi normali di Frumento. (The susceptibility to *U. tritici* (Pers.) Jens. of some normal hybrids of wheat).  
Riv. Patol. Veg. 1939 : 29 : 71-84.

The 11 varieties tested are classed as highly resistant, moderately and highly susceptible. The two resistant varieties were Littorio and Federation x Khapli;  $F_1$  hybrids of these with the susceptible varieties were almost fully resistant, as were hybrids between the two resistant varieties. Hybrids of two susceptible varieties were as susceptible as the parents and those from susceptible x moderate were intermediate in resistance. No differences were observed between reciprocal hybrids.

The degree of infection on the plant was found to be a more reliable criterion than the ear infection.

742. PETERSON, R. F.,  
JOHNSON, T. and  
NEWTON, M. 633.11-2.452-1.521.6  
Varieties of *Triticum vulgare* practically immune in all stages of growth to stem rust.  
Science 1940 : 91 : p. 313.

Six wheat varieties tested at the Dominion Rust Research Laboratory, Winnipeg, appear to be virtually immune to all the races of stem rust so far used in tests. Some 30 such races have been used in the field in each of several years and 20 races were tried in the greenhouse in tests on seedlings. The varieties included five lines obtained from the Department of Agriculture in Kenya and the other one, now known as McMurachy's Selection, was derived from a resistant rogue found by a Canadian farmer in a field of Garnet wheat.

Occasional rust pustules found on these wheats appear to have been caused by infection of young parts of the stem within the leaf sheath.

743. 633.11-2.452-1.521.6:575.11  
PAN, C. L. 633.11-2.3-1.521.6:575.11:519.241.1  
A genetic study of mature plant resistance in spring wheat to black stem rust, *Puccinia graminis tritici* and reaction to black chaff, *Bacterium translucens*, var. *undulosum*.  
J. Amer. Soc. Agron. 1940 : 32 : 107-15.

The inheritance of stem rust resistance was studied in a series of wheat crosses grown in the open. The variety Marquis x H44, III 31-7 was found to carry a single dominant gene pair for resistance which is allelomorphous to that carried by Hope and H44. Minnesota Double Cross II-12-80 was found to carry two complementary pairs of genes for partial resistance similar to those carried by Pentad x Marquis III-34-1.

Susceptibility to black chaff appeared to be dominant to resistance. Resistance to stem rust was associated with susceptibility to black chaff, but the association was not complete; however no single plant susceptible to both diseases was found\*.

744. SINGH, R. and 633.11:664.641.016  
BAILEY, C. H. 633.11:575(54.5)  
A biochemical and technological study of Punjab wheat varieties.  
Cereal Chem. 1940 : 17 : 169-203.

A review is given of the wheat breeding work that has been carried out in the Punjab. Roughly 50% of the total wheat acreage is now sown to improved varieties, principally 8A, but also the more recently released varieties C518, C591 and 9D. Selection work is proceeding on the progenies of 57 new crosses made since 1929 and in the present paper a detailed investigation of the milling and baking qualities of 23 of these selections in comparison with the above

\* Abstractor's note. Cf. however "Plant Breeding Abstracts", Vol. X, Abst. 117.

four widely-grown varieties is reported, samples being taken from both irrigated and non-irrigated sowings.

Correlations between some of the grain, flour and dough properties studied are also computed.

745. 633.11 *Aegilops* : 576.354.46:576.312.34:576.16

KIHARA, H. 633.11 *Aegilops* : 575.127.2

Verwandtschaft der *Aegilops*-Arten im Lichte der Genomanalyse. Ein Überblick. (**Relationship between the *Aegilops* species in the light of genom analysis. A survey**).

Züchter 1940 : 12 : 49–62.

This review collates the morphological, geographical and cytogenetical findings of various investigators (including some unpublished work of the writer and his collaborators) of *Aegilops* species, special emphasis being laid on karyotype genom analyses as a basis for the study of the systematic relationships between the members of the genus.

Morphological observations on the type of fracture of the ear at maturity and the awning of the glumes in numerous interspecific hybrids studied by the writer have—with the results of genom analysis—provided the basis for a new provisional classification of the genus on the basis of the types of genomes present in the various species.

### BUCKWHEAT 633.12

746. SALTYKOVSKY, A. I. 633.12:582

**On the taxonomy of common buckwheat (*Fagopyrum esculentum* Moench) and *Fagopyrum emarginatum* Roth.**

C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 26 : 180–82.

The two species intercross readily and in their morphological characters show transition forms. Winged (*emarginatum*) types have also been known to segregate winged and non-winged (*esculentum*) progeny. The two forms are not geographically isolated and it is concluded that there is no warrant for separating them into distinct Linnean species.

Brief descriptions of the main geographical forms of *F. esculentum* are given.

747. STOLETOVA, E. A. 633.12:582:576.16

**(Ecological and geographical classification of buckwheat).**

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : No. 2 : 7–10.

The Himalayas are regarded as the centre of origin of the genus *Fagopyrum*; its range of variation is much less than that observed in the older genera such as the cereals. Clear ecological groups can however be established and their main characteristics are described.

### OATS 633.13

748. GELIN, O. and

UNDENÄS, S.

633.13:575(48.5)

Weibulls Bambuhavre 1934–1939. (**Weibull's Bambu oats 1934–39**).

Weibull's Ill. Årsb. 1940 : 35 : p. 30.

Owing to its earliness the Bambu oat (which has matured on an average 5 days earlier than Gullregn II) is now grown further and further north. In one district it is reported in 1939 as having yielded 11% more than Orion II and being fully ripe on 1st September; and record yields were also obtained elsewhere. Its stiffness of straw renders the variety resistant to lodging even when grown on soils rich in nitrogen and ensures tolerance of heavy nitrogen manuring to increase yield.

749. OESCU, C. V.

633.13:575.242

Sur un cas de fausse folle-avoine homozygote dans une lignée d'*Avena sativa* L. (**On a case of false wild oats in the homozygous condition in a line of *A. sativa* L.**).

Bull. Sect. Sci. Acad. Roum. 1938 : 19 : 148–52.

This is a record of an individual plant which appeared after three years in a line of *A. sativa* L. and had ears like those of *A. fatua* but in the morphological characters of its straw and panicle resembled *A. sativa*. The aberrant form is shown to be a fatuoid mutant which has appeared *ab initio* in the homozygous state.

750.

633.13-2.45-1.521.6:575.11

633.13:575.116.1:581.48

633.13:575"793"

TORRIE, J. H.

**Correlated inheritance in oats of reaction to smuts, crown rust, stem rust, and other characters.**

J. Agric. Res. 1939 : 59 : 783-804.

The mode of inheritance of reaction to a mixture of loose and covered smuts, crown rust and stem rust was studied in several oat crosses. Smut resistance was determined by two gene pairs, one for high resistance and the other for partial resistance.

The segregation for crown rust reaction in the progeny of Iowa No. 444 x Bond suggests the presence of two gene pairs, *S*, a gene for crown rust resistance and *I*, a gene which partly inhibits the expression of *S*. The action of *I* was more pronounced in the mature plant stage in the field than in the seedling stage in the greenhouse. Inoculations with three individual races of *Puccinia coronata* gave results similar to those obtained with a mixed inoculum. Stem rust resistance was found to be determined by a single gene pair, resistance being dominant over susceptibility. A very close correspondence between seedling and mature plant reactions was found.

In the cross Iowa No. 444 x Bond the following grain characters were each found to be determined by a single gene pair: basal hair length and number, basal articulation and rachilla attachment. Colour of the glumes, the presence of awns and the ratio of grain width to length were each determined by two genes. All the grain characters studied were linked, basal articulation of the grains and basal hair number absolutely so. The exact gene order was not determined, but in one population the results indicated the following order and cross-over percentages: yellow paleae—39.1—basal articulation and basal hair number—0.7—awning—17.3—rachilla attachment—31.8—red paleae—3.0—basal hair length.

A partial dominance of earliness was found in two crosses studied. There was a significant negative correlation between the length of the period from emergence of the seedlings to heading and the period from heading to maturity.

In the cross Iowa No. 444 x Bond smut and crown and stem rust reaction were inherited independently of each other and of the characters earliness, basal articulation and basal hair length.

751. DOWN, E. E. and

THAYER, J. W.

633.13-2.451.2-1.521.6:575(77.4)

**Huron, a new oat variety for Michigan.**

Quart. Bull. Mich. Agric. Exp. Sta. 1940 : 22 : 209-12.

The new variety was selected from the cross Markton x Victory. It has outyielded the standard variety Wolverine in most trials and the grain has a considerably higher bushel weight. It has proved highly resistant to smut, and ripens 2 to 4 days earlier than Wolverine which it is intended to replace.

**MAIZE 633.15**

752.

633.15:575(73)

**Report of the Second Corn Improvement Conference (First Field Meeting) held at the University of Wisconsin, Madison, Wisconsin. September 16-17, 1938.**

Washington, D.C. 1939 : Pp. 53. (Mimeographed).

This publication consists principally of a report from each of the main maize-growing states of the U.S.A. in which the outstanding commercial hybrids, first crosses and inbred lines at present in production are listed and their most striking characteristics described. The policy of each state with regard to certification of hybrids and such matters as the release and distribution of inbred lines is also summarized.

Other matters dealt with include the problem of preserving present-day open pollinated stocks as a source of future breeding material and a report on the low temperature storage of seed with the object of reducing the frequency with which inbred and other stocks have to be regrown by the breeder to keep them viable.

753.

633.15:575(73)

**Report on the Third Corn Improvement Conference held at the University of Missouri, Columbia, Missouri, November 27 and 28, 1939.**

Washington, D.C. 1940 : Pp. 21. (Mimeographed).

The breeding work on white maize being carried out in various states of the U.S.A. is briefly reported and discussed.

An interesting discussion on maize breeding methods is also reproduced. Much more attention than formerly is now being given to the improvement of existing inbred lines by intercrossing and selection or by "convergent improvement." Hayes reports that in Minnesota no valuable inbred line has been selected from open-pollinated varieties. Convergent improvement work in that State has, however, led to inbred lines higher yielding than the parents and improved in smut resistance, seed type, etc. In Iowa Sprague reports similar improvements of yield in recovered inbred lines. In Ohio back-crossing and intercrossing of inbred lines are also being carried out. Inbred line 51 has been improved with respect to its heat resistance and root system without a decrease in yield. Jenkins has succeeded in transferring considerable husk protection to various Corn Belt lines by crossing them with a long-husked inbred line and then back-crossing the  $F_1$  hybrids to the Corn Belt parent and selling three times. Mangelsdorf considered that the use of genera related to *Zea* as yet holds no promise in breeding work. He reports that Texas inbred lines show exceptional drought resistance and may well be used in breeding work elsewhere, while for Texas he considered that the greatest immediate improvement is likely to come from modifying the Corn Belt inbreds to suit Texas conditions.

With regard to the utilization of inbreds, Eckhardt points out that the greatest uniformity in a double cross is obtained when the inbreds are arranged so that the more nearly similar pairs are combined to give the first crosses. A lengthy discussion of the value of top-crossing in testing the combining ability of inbreds then follows. Though very valuable and strongly recommended by some workers, others felt that the cost of the yield trials involved was so great as compared with the cost of carrying on inbred nursery lines that top-crossing was not the most economical way of achieving the desired end.

Stadler, Stringfield and Jenkins all appear to be advocates of the improvement of existing double cross combinations rather than the building up of entirely new ones. Stringfield reports such an attempt at improvement in which the resulting hybrid had 10 bushels higher yield and showed less breaking. Jenkins worked on Iowa Hybrid 13. He crossed each of the four inbred parents with lines that corrected certain weaknesses and tested the recovered lines in crosses with the opposite single-cross parent of the hybrid.

A report on the steps being taken to preserve valuable open-pollinated stocks is given.

A summary of the breeding work for resistance to pests and diseases that is being carried out is also given. Information on the relative resistance of various inbreds is given by several workers, and also data on certain correlations that have been detected with plant characters

754.

633.15:575(77.7)

**Report on agricultural research for the year ending June 30, 1939.**

**Part II. Iowa Corn Research Institute fourth annual report.**

Ia Agric. Exp. Sta. 1939 : Pp. 88.

A study of the changes in starch properties resulting from crossing pure lines of maize has been started.

The production of new inbred lines has continued on a large scale. Emphasis has been placed on the improvement of old standard lines by Richey's method of convergent improvement. A considerable number of original and recovered ("second cycle") lines have been compared in top-crosses; many of the recovered lines were similar to the original types in yield and other desirable characters but others appear to be distinct improvements. Whereas the better original lines average only 40 to 45% of the yield of the varieties from which they were derived, the better second cycle lines average 50 to 60%. Back-crosses of second cycle inbreds were carried out in 1938, so beginning the third cycle of improvement.

The results of a large number of trial crosses indicate that new hybrids much superior to present-day types may be anticipated.

Progenies of selected third generation inbred plants of L 317B2 x B1 345 B were tested by top-crossing with Krug, and the results show that no important segregation within families for yield factors is occurring at this stage.

Sweet corn breeding work has also been continued. Some 200 new crosses between inbred lines were made during the year and much selfing was also carried out. Four Iowa sweet corn hybrids are now in commercial production—logent 27, logent 12, Ioana and Ioglen. The last is being grown in Texas for the early green corn market and shows considerable resistance to ear worm.

Studies on the development of inbred lines of field corn resistant to ear rots were carried on. Work on popcorn has included tests of inbred lines in top-crosses and tests of a large number of hybrid combinations; more emphasis has been placed on the popular yellow pearl varieties. A three-way cross, Iojap, was distributed for trial on a large scale in 1937 and most reports have been favourable. Seed of 26 other crosses has been distributed for commercial trial.

Genetic studies included linkage tests which established that the gene *kn* (knotted leaf) is located in chromosome 1, the gene order being *br-f<sub>1</sub>-kn-Bm<sub>2</sub>*. The knotted leaf character is variable in its expression and it was shown that most of this variability was due to modifying genes.

The gene *g<sub>3</sub>* (golden plant colour) was tested together with genes from chromosomes 1, 2, 3, 4, 5, 7 and 10 and no significant linkage found.

Work was continued on the genetics of a giant plant type. Tests of various mutants for linkage with 10th chromosome genes were carried out.

Studies of relative growth rates of hybrids and inbred lines were made. Inbred lines in general have smaller embryos than hybrids but the subsequent relative growth rates of hybrids and inbreds are remarkably similar. A comparison of seven sets of crosses between late and early varieties did however show a significantly higher relative growth rate in hybrids than in inbreds. Such early x late hybrids appear to inherit the higher growth rate of the early parents in the early stages of growth and the higher growth rate of the late parents later in development. The hybrids with the early parent as the female were consistently better than the reciprocals.

Genetic investigations on resistance to bacterial wilt in maize were carried out. Passage of mixtures of strains of the bacterium through a resistant host led to an increase of the virulent strains, and passage through a susceptible host caused a loss of virulence. This loss was observed even when single cell cultures of a virulent strain were used. Studies of mutation ratios in the bacterium were made and they were found to be similar to those recorded for higher plants and animals. Experiments involving X-ray irradiation of the bacteria were also carried out.

Extensive studies on the resistance of maize varieties to *Ustilago zeae*, *Diplodia zeae*, *Basisporium gallarum* and *Gibberella Saubetnii* are reported and also further studies on the relationship between embryo size and plant vigour in hybrids and inbreds.

755. OLSON, P. J. 633.15:575.113.4-18  
**Exchange of certain alternative stable characters in crosses between dent and flint corn.**

Tech. Bull. N. Dak. Agric. Exp. Sta. 1939 : No. 291 : Pp. 38.

Flint corn is typically characterized by a tillering habit and by the presence of long leaf-blades on the husk, while dent corn is typically non-tillering and has either very short husk blades or none at all. The inheritance of these characters was studied in crosses; both tillering and husk blades appeared to be determined by multiple genes and the skewness of the distributions suggested that the genes concerned may be multiplicative rather than additive in their action. Row number was also determined by multiple genes and it was impossible to recover even the eight-rowed condition in the pure form.

A few "reverse types" with flint ears associated with the normal vegetative characters of dent corn and *vice versa* were isolated.

756. SALAMOV, A. B. 633.15:575.12:575.14  
**(Inbreeding maize).**  
 Seleksijska i Semenovodstvo (Breeding and Seed Growing) 1939 : Nos 10-11 : 22-27.

The practice of producing single and double cross hybrids on a large scale is described. Experiments are reported and figures presented on the basis of which it is concluded that by selecting the best plants in the F<sub>2</sub> generation of a cross the fall in yield in later generations can be avoided and yields maintained as high as, or even higher than the F<sub>1</sub>.

Less depression was observed on inbreeding hybrids between inbred lines than inbreeding commercial varieties and in this way two lines outyielding the standard variety Sterling have been produced. These lines, which are not yet entirely constant, "can be worked up finally by other breeding methods".

757. COPPER, R. R. 633.15:575.12:631.557:581.056  
**Hybrid corn stabilizes corn yields.**

Trans. Ill. Acad. Sci. 1939 : 32 : 43-45.

Data extracted from reports of the Illinois corn performance test bulletins show that maize hybrids exhibit less year-to-year variation in yield than do open-pollinated varieties.

758. SINGLETON, W. R. 633.15:575.182:581.331.2  
**Influence of female stock on the functioning of small pollen male gametes.**

Proc. Nat. Acad. Sci. Wash. 1940 : 26 : 102-04.

Previous studies have shown that in crosses in which maize plants heterozygous for the small pollen gene  $sp_1$  are used as the male parent, usually less than 1% of the  $sp_1$  pollen grains function. In crosses in which the sweet corn lines Purdue 39 and Connecticut 81 were used as female parents and the male parent was of the constitution  $sp_1su/Sp_1Su$ , 39% and 17% respectively of the resulting kernels were  $su$ , whereas only 6% (the cross-over ratio between  $sp_1$  and  $su$ ) would have been expected if only  $Sp_1$  grains had functioned. Progeny tests and pollen examinations confirmed the supposition that in these crosses a considerable proportion of  $sp_1$  grains functioned.

759. KOZHUHOV, I V. 633.15:576.16  
**(An experiment in construction of a system of evolution of *Zea mays*).**

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1939 : No. 20 : 14-17.

The presence in certain countries of groups of forms characteristically differing from the maize of other areas has led the author to separate these groups out, sometimes as different species, e.g. the Mexican plateau group of highly pubescent forms, bearing tassels with only 4 to 8 lateral branches and sessile spikelets, and characterized by very shallow root system, proneness to lodging, etc., etc. has been classed as *Zea hirta* (Bonaf.) Kozh. The remaining, more common, maize forms have been ascribed to the species *Z. mexicana*, which is divided into five subspecies, which in turn are divided into *proles*.

760. MANGELSDORF, P. C. and 633.15:576.16  
 REEVES, R. G. 633.15:575.127.5

**The origin of Indian corn and its relatives.**

Bull. Tex. Agric. Exp. Sta. 1939 : No. 574 : Pp. 315.

This is a very comprehensive and valuable treatment of the problem of the origin of maize. The literature on the subject is dealt with in detail and the pertinent genetical, cytological, archaeological and other data (including many original findings) reviewed. The authors' conclusions, which though heterodox are supported by an impressive amount of evidence, may briefly be summarized as follows: The genus *Zea* (consisting of a single species) and the more variable genus *Tripsacum* stemmed from a remote Andropogonaceous ancestor belonging probably to the stock which also gave rise to *Saccharum* and *Sorghum*. The wild progenitor of maize was probably a native of the lowlands of Paraguay, north-eastern Bolivia or south-western Brazil and closely resembled homozygous pod corn (*Z. Mays* var. *tunicata*). The primary centre of cultivation appears to have been in Peru. The essential step in this evolution of modern cultivated types from primitive pod corn was the mutation of the gene *Tu* (tunicate) to *tu*, which led to the disappearance of the glumes which formerly enveloped the grains.

The maize of South America eventually spread northwards into Central America and Mexico where it first came into contact with *Tripsacum*, from which it had been separated since remote geological time. Hybridization between the two genera appears to have occurred and given rise to *Euchlaena*, which the authors have shown to differ from *Zea* principally in four chromosome segments derived from *Tripsacum*. *Euchlaena* and *Zea* readily hybridize and give fertile hybrids and it appears that extensive crossing has led to the infiltration of *Tripsacum* characters into Central and North American maize. Here we have, then, a secondary centre of distribution of maize types, the primary centre being in Peru. Mexican pointed pop corn, dent corns and other northern types (e.g. the long and narrow-eared varieties with straight

rows found in the south-western United States) are believed to have arisen from contamination with *Tripsacum* via *Euchlaena*.

The authors' treatment is very thorough and detailed (though occasionally unduly repetitive) and this monograph is likely to be a standard work of reference on the subject for many years.

761. RANDOLPH, L. F. and 633.15:581.6:576.356.5  
HAND, D. B. 633.15:577.16

**Relation between carotenoid content and number of genes per cell in diploid and tetraploid corn.**

J. Agric. Res. 1940 : 60 : 51-64.

Tetraploid maize types were compared with the corresponding diploids with respect to endosperm cell size and the content of carotinoid pigments in the endosperm. Doubling the chromosome number in pure yellow corn led to a 40% increase in total carotinoid pigments and a corresponding increase in the pro-vitamin A fraction ( $\beta$ -carotin and cryptoxanthin). The volume of the endosperm cells was increased 3.6 times when the chromosome number was doubled. The net result therefore was that the amount of carotinoid pigments per cell was increased five-fold, the amount elaborated per gene being 2.5 times that in the diploid. The genes for yellow endosperm therefore appear to exert a cumulative action following chromosome doubling.

Doubling the chromosome number in white corn decreased the carotinoid content by 19%, indicating that no cumulative gene action was exhibited.

The carotinoid content varied widely between different varieties, inbreds and hybrids of diploid yellow corn and it was noted that the yellow appearance of the grain was not a reliable criterion of carotinoid content.

762. HEYNE, E. G. and 633.15-2.112-1.521.6:575:578.08  
LAUDE, H. H.

**Resistance of corn seedlings to high temperatures in laboratory tests.**

J. Amer. Soc. Agron. 1940 : 32 : 116-26.

Various trials on maize seedlings led to the conclusion that a heat treatment of 20-day-old seedlings for five hours at 130° F. with a relative humidity of 20 to 30% gave a reliable estimate of their field resistance to heat and drought. Tests with ten inbred lines and one open-pollinated variety of known field behaviour are reported. Only one inbred showed a type of behaviour in the test significantly different from that in the field, possibly because it was a type with slow growth and apparent chlorophyll deficiency in the seedling stage.

The method was also shown to be suitable for classifying segregating populations for resistance to heat and drought. It should be of great use to the breeder, whose work in developing resistant lines may otherwise be held up by a succession of seasons in which extreme weather conditions are not experienced.

**BARLEY 633.16**

763. BRIGGS, F. N. 633.16:575(73)

**Production and improvement of malting barley in California.**

Amer. Brewer 1939 : 72 : p. 37; also Brewers Digest 1939 : 14 : 30-31.

Prior to 1910 the only variety of any importance was Coast (also known as Common and Bay Brewing). Thousands of other varieties were tested but none proved equal to Coast; improvement in this variety itself has been effected by selection, since the variety was far from pure. Several of these selections are described, the best being Atlas, which has outyielded Coast and is superior in straw and malting quality. Experiments now in progress have the object of adding resistance to mildew and scald to Atlas without altering its varietal type.

764. GREIS, H. 633.16:576.356.5:581.1

Vergleichende physiologische Untersuchungen an diploiden und tetraploiden Gersten. (Comparative physiological investigations on diploid and tetraploid barleys).

Züchter 1940 : 12 : 62-73.

Various Japanese and other barleys having been examined, the Japanese variety Kobai was chosen as most suitable for testing and was treated with colchicine, 14 tetraploid plants and 18 chimaeras being obtained from 100 treated seeds.

As compared with diploid forms the tetraploids proved to have a lower cell sap concentration, nitrogen content and dry matter content, but a higher number of stems, a higher yield of

straw per plant, a higher ash content of the stem, greater thickness of stem and larger stomata, pollen grains and exodermal cells. The germination capacity was less in the tetraploids and the duration of the germination period was longer.

765. COPERTINI, S. 633.16:581.6(61.2)  
 Esame chimico-tecnologico di orzi della Libia. (**Chemical and technological study of the barleys of Libia**).  
 Agricoltura Colon. 1939 : 33 : 626-32.

Tabular data are given concerning the water absorbing capacity, germination, hectolitre weight, grain size, purity, moisture content, total and soluble nitrogen, extract, ash content and malting quality of the Libian barleys. Some of them (e.g. Zuara and Martin) are seen to be quite comparable with the best Bohemian varieties, and have maintained the good qualities even in unfavourable years.

766. MAYR, E. 633.16-1.524(43)  
 Die ostmärkischen Gerstenzuchtsorten. (**The pedigree barleys of the Ostmark**).  
 Züchter 1940 : 12 : 16-19.

Descriptions of fourteen varieties are presented in a table showing the place where bred, the original variety or cross, the main area of cultivation and various distinctive morphological characteristics some of which are also illustrated. A key to the different types of habit found in the barleys of the district is included. (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 480).

### MILLETS AND SORGHUM 633.17

767. KADAM, B. S.,  
 PATEL, S. M. and  
 KULKARNI, R. K. 633.171:575.14:575.11  
**Consequences of inbreeding in bajri.**  
 J. Hered. 1940 : 31 : 201-07.

Inbreeding bajri (pearl millet, *Pennisetum typhoides*), a normally cross-fertilized cereal, led to the appearance of various genetic abnormalities which are here described. They include six phenotypically distinct chlorophyll deficient types, albino, yellow, virescent-yellow, virescent-white, zebra (characterized by transverse white stripes which later turn green) and golden-yellow. All of these were recessive and their condition either lethal or, at best, considerably weaker than the normal type. Genetic ratios of 3:1, 15:1 and 9:7 were observed but they can only be regarded as rough indications of the mode of inheritance, since the muslin bags used to exclude foreign pollen were by no means efficient.

Four recessive types of sterility were also obtained, and also a recessive dwarf type which apparently arose as a mutation.

Pearl millet was found to show considerable loss of vigour on inbreeding, but this loss was greater in some lines than in others.

The tables belonging to this paper are published separately on micro-film or as photographic prints.

768. STEPHENS, J. C. and  
 QUINBY, J. R. 633.174:575.116.1  
**The *D Rs P* linkage group in sorghum.**  
 J. Agric. Res. 1939 : 59 : 725-30.

The gene pairs *D-d* (dry v. juicy stalks), *Rs-rs* (red v. green seedling colour) and *P-p* (purple v. brown plant colour) were found to be linked, the gene order and cross-over percentages being as follows: *D* (10.9) *Rs* (16.4) *P*.

Two or three members of this linkage group were found to be inherited independently from the gene pairs *S-s* (presence v. absence of spreader), *R-r* (coloured v. white seed), *A-a* (awnless v. awned paleae), *Al-al* (normal v. antherless flowers), *Ms-ms* (normal v. male-sterile flowers) and *Wx-wx* (starchy v. waxy endosperms).

769. DAHMS, R. G. and  
 MARTIN, J. H. 633.174-2.7-1.521.6:575.11:578.08  
**Resistance of  $F_1$  sorghum hybrids to the chinch bug.**  
 J. Amer. Soc. Agron. 1940 : 32 : 141-47.

The determination of the amount of resistance to the chinch bug (*Blissus leucopterus*) in hybrid

populations of sorghum by measuring the amount of injury to the plants is impossible owing to the frequent occurrence of hybrid vigour. A special celluloid cage which may be affixed to plants in the field was therefore devised. The relative resistance of plants may successfully be determined by observing the number of eggs laid by chinch bugs confined in the cages, more eggs being laid on susceptible plants. Longevity of the females is a less satisfactory criterion.

Observations on 11  $F_1$  hybrids indicated that in most cases resistance was dominant to susceptibility. There was no apparent relationship between hybrid vigour and resistance as determined by number of eggs laid. One of the hybrids, Texas Blackhull kafir x Sumac sorgo, appeared to be more resistant than Atlas sorgo, one of the most resistant varieties so far known, and attempts are being made to isolate valuable resistant lines from this cross.

The new method of testing resistance is expected to be very valuable to breeders in the selection of parental combinations which carry cumulative factors for resistance and from which lines more resistant than either parent may therefore be selected.

### RICE 633.18

770. JENKINS, J. M. 633.18:575(76.3)  
**Biennial report of the Rice Experiment Station Crowley, Louisiana  
 1937-1938.**

La St. Univ., Agric. Mech. Coll., Agric. Exp. Sta. Pp. 32.

Selection work on 25 crosses made in 1929 is continuing and all but three or four have now been discarded as being unlikely to yield improved commercial varieties, though some of the others may yield useful breeding material. The most promising lines are from the crosses Edith x Fortuna, Colusa x Blue Rose and Kameji x Blue Rose, and some of them are more disease resistant or slightly earlier than Blue Rose.

The progenies of 50 or more crosses made since 1932 are also being selected. The cross Iola x Blue Rose has yielded an early strain which is resistant to *Cercospora* and has satisfactory milling and fairly good cooking quality. Rexoro x Delitus, Rexoro x Fortuna, Rexoro x Blue Rose, and Nina x Blue Rose are other promising crosses and some of their derivatives are noteworthy in such characters as freedom from shattering and disease resistance.

It is stated that one of the most difficult problems in rice breeding is the combination of good milling and table quality, since the characters which lead to good milling quality apparently also lead to poor cooking properties.

Strains of the Blue Rose variety resistant to *Cercospora* are being bred (cf. "Plant Breeding Abstracts", Vol. X, Abst. 455) and one resistant strain appears to be relatively free from white tip.

Variety trials of rice, cotton, sorghum and soya beans are reported.

771. TERA0, H. and MIDUSIMA, U. 633.18:575.12:581.162.5:576.16  
**Some considerations on the classification of *Oryza sativa* L. into  
 two subspecies, so-called '*Japonica*' and '*Indica*'.**  
 Jap. J. Bot. 1939 : 10 : 213-58.

Studies of 26 rice varieties and crosses between them in 140 different combinations (previously reported in Japanese, cf. "Plant Breeding Abstracts", Vol. X, Abst. 151) show that the division of cultivated rice varieties into two intra-fertile, inter-sterile groups *Japonica* and *Indica* proposed by Kato (cf. "Plant Breeding Abstracts", Vol. I, Abst. 543) is not valid, since the real situation is much more complex. The  $F_1$  hybrids studied showed degrees of pollen abortion ranging from 0 to almost 100%. In most cases the amount of embryo sac abortion was similar to the pollen abortion, though some of the crosses involving the varieties  $I_4$ , F and  $I_6$  showed a much smaller amount of embryo sac abortion, a condition apparently genetically determined.

It was possible to group the 26 varieties into three groups. Group I contained 12 Japanese, 3 American and 2 Javanese varieties, while group III contained one variety each from French Indo China, Formosa, India and Hawaii. Crosses between these two groups showed very marked sterility. Group II, containing five Indian varieties, occupied an intermediate position, giving in some cases fertile and in others sterile hybrids in crosses with groups I or III.

Kato claimed to be able to distinguish the two sterility groups *Japonica* and *Indica* on the

basis of grain shape, while Hamada used mesocotyl length as a criterion. The present study shows that while regional differences in these characters do exist they do not run parallel with the sterility groups.

## OTHER CEREALS 633.19

772. CIFERRI, R. and BALDRATI, I. 633.19:633.288(63)  
 I cereali dell'Africa Italiana. II. Il "Teff" (*Eragrostis Teff*) cereale da panificazione dell'Africa Orientale Italiana montana. [**The cereals of Italian Africa. II. Teff (*E. Teff*), a bread cereal from the mountains of Italian East Africa**].  
 Bibl. Agrar. Colon., Firenze 1939 : Pp. 106.  
 CIFERRI, R. and BALDRATI, I.  
 La cerealicoltura in Africa orientale. VI.—II "Teff" (*Eragrostis Teff*). [**Cereal cultivation in East Africa. VI.—Teff (*E. Teff*)**].  
 Ital. Agric. 1940 : 77 : 170–76.

Descriptions are given of the plant and of the related species. The subdivisions of the species are then discussed, some of them being indicated as definitely hybrids. In Italian East Africa three main forms are grown for grain, the white, the grey and the red grained. Data are given concerning samples of these as regards moisture content, 100 grain weight and size of grain, from which it is concluded that neither form is pure, the white showing in every respect more variation than the red.

The origin of the plant and of its cultivation is discussed, the conclusion being reached that it is derived from the closely related wild species *E. pilosa* (L.) P.B., which is even still collected by the local population and used for its farinaceous grains.

Details are given relating to the cultivation of the plant, the composition of its grain and the flour produced therefrom, which, though low in gluten, has proved to be highly nutritious. The value of teff as a forage plant is also stressed.

## FORAGE GRASSES 633.2

773. MÜNTZING, A. 633.21:581.163:576.356.5  
**Further studies on apomixis and sexuality in *Poa*.**  
 Hereditas, Lund 1940 : 26 : 115–90.

The results of studies on apomixis and related phenomena in *Poa pratensis* and *P. alpina* are described in detail. The following conclusions are reached.

There is a gradation from strains which produce nearly all their offspring sexually to those which are almost exclusively apomictic. In *P. alpina*, apomicts from Switzerland most often had  $2n = 37$ , those from Scandinavia  $2n = 33, 38$  and  $35$  and it is believed that similarity in chromosome number may be evidence of relationship. Polyploidy in these species is considered to be to a large extent autopolyploidy, especially in *P. alpina*.

Sexual strains with oscillatory chromosome numbers occur. Apart from a general tendency for individual progenies to decrease in chromosome number as compared with their mothers, the functioning of unreduced gametes and possibly selection of high-chromosome gametes operate to raise the chromosome number while haploid parthenogenesis operates in the opposite direction. No correlation was observed between chromosome number and vigour. Selection for low chromosome number in a strain of this type produced a stable but still sexual line with 22 chromosomes and  $11_{II}$  at meiosis and it is suggested that this is a case of secondary balance, the basic number in other *Poa* species being 7.

Unlike the aposporous *P. pratensis*, apomictic forms of *P. alpina* reproduce by diploid parthenogenesis.

Two viviparous strains of *P. alpina* from Switzerland are believed to be closely related to agamospermic strains from the same locality, because of their unusual but similar chromosome numbers.

In crosses between sexual and apomictic strains of *P. alpina* no apomictic forms were obtained in  $F_1$  or  $F_2$ . The chromosome numbers of the parents were 24 and 38 and in  $F_1$  chromosome numbers ranged from 25 to 43, both reduced and unreduced female gametes having functioned. Some  $F_1$  plants with high chromosome numbers regularly produced haploids to an extent of 15% of their progeny. This is believed to be due to a combination of the parental tendencies

to chromosome reduction and parthenogenesis. Since all the  $F_2$  plants tested were sexual, apomixis cannot be due to a single gene but rather to special constellations of genes and chromosomes brought about by natural selection. It was observed that in *P. pratensis* the formation of haploids or triploids from predominantly apomictic forms leads to purely sexual reproduction or an increased degree of sexuality.

Haploid-diploid and triploid-diploid pairs of twins have been found in *P. pratensis*. The haploids are easily distinguished by their smaller size and slender habit. The triploids were compared with their diploid sibs in some detail. It was found that they develop more slowly and in most cases were less productive than the diploids. Chemical analysis failed to reveal any differences. The triploids had thicker and broader leaves and usually thicker culms, heavier seeds and shorter spikelets.

In both *P. alpina* and *P. pratensis* cell size was positively correlated with chromosome number.  
J. L. F.

774. MIÈGE, J. 633.284:576.312.35  
Contribution à l'étude des Phalaridées. (**Contribution to the study of the Phalaridae**).  
Bull. Soc. Hist. Nat. Afr. N. 1939 : 30 : 223-45.

*Inter alia* the following chromosome numbers are confirmed: *Phalaris paradoxa* L.  $2n = 14$ , *P. minor* Retz.  $2n = 28$ , *P. canariensis* L.  $2n = 12$ , *Anthoxanthum odoratum* L.  $2n = 20$ ; the following are reported for the first time: *P. brachystachys* Link.  $2n = 12$ , *P. tuberosa* L.  $2n = 28$  and *P. coerulescens* Desf.  $2n = 28$ .  
J. L. F.

#### LEGUMINOUS FORAGE PLANTS 633.31/37

775. FISCHER, A. 633.3:576.16  
633.367:576.16  
Nordamerika als Genzentrum verschiedener Leguminosen-Gattungen und -Arten. (**North America as gene centre for various leguminous genera and species**).  
Forsch. Fortschr. dtsh. Wiss. 1938 : 14 : p. 214.

FISCHER, A. 633.3:581.9:576.16(7)  
**North America as a gene centre of various genera and species of Leguminosae.**  
Res. & Progr., Berlin 1939 : 5 : 297-99.

The practical importance of some of the plant forms found in the N. American gene centre is illustrated by reference to certain lupins with a high oil content. The centre is also distinguished by a great wealth of forms of other leguminous species for both grain and forage, the study of which promises to yield valuable new economic forms.

776. SVESHNIKOVA, I. N. 633.35:575.11.061.6:581.46  
(**Cyto-genetic analysis of *Vicia* species. I. Genetic description of flower colour in *V. sativa* L.**).  
Biologičeskii Žurnal (Biologicheskij Zhurnal) 1938 : 7 : 1067-92.

Three main genes for flower colour were established, *AA*, the basic colour gene, *BB* for purple and *CC* for pink; there were also *a<sup>s</sup> a<sup>s</sup>*, an inhibitor and *a<sup>r</sup> a<sup>r</sup>*, a partial inhibitor of colour, *b<sup>l</sup> b<sup>l</sup>* for light purple and *c<sup>b</sup> c<sup>b</sup>* producing a white flower with pink borders to the standard. The results of a number of crosses are reported and shown to conform to this interpretation. Monohybrid, dihybrid and trihybrid ratios were obtained in different crosses and various new colours, expected on theoretical grounds but not existing in nature, emerged. In the presence of the basic gene *A* the recessives *bb* and *cc* produced a faint mauve pigmentation, pure white flowers being found only in the absence of *A*.

The scheme of flower colour inheritance in *Vicia* is closely analogous to that in the allied genera *Pisum* and *Lathyrus*. The European races were found to be differently constituted from those of Asia Minor, the latter being characterized by partial inhibitors allelomorphous with the genes for full expression found in the European forms.

777. UFER, M. 633.366:581.192.6:578.08  
 Ein züchterisch brauchbares Verfahren zur Auslese cumarinarmer Formen  
 beim Steinklee. [**A method practicable in breeding work for the  
 selection of forms of sweet clover (*Melilotus*) with low cumarin  
 content**].  
 Züchter 1939 : 11 : 317-21.

The method described enables one worker to test about 2,500 plants daily. Seedling leaves are placed in depressions in a plate with strong alkali and heated in a steam oven for about 2 hours. They are then examined for fluorescence. Normally the light yellowish-green fluorescence of orthocumaric acid obscures the blood-red fluorescence of the chlorophyll pigments and where the plant was cumarin-free it is readily detected by the blood-red fluorescence. Plants with a low cumarin content give an intermediate fluorescence.

Most of the cumarin-free plants found were only temporarily so and later turned bitter.

A method of estimating the cumarin content by extraction is also described. J. L. F.

778. 633.367:575.242  
 SENGBUSCH, R. von. 633.367:575.11.061.6:581.48  
 Die Auffindung einer neuen weissamigen Mutante im Süßlupine-Stamm 8  
 (Stamm W 8/37, *Lupinus luteus*). [**The discovery of a new white seeded  
 mutant in the sweet lupin strain 8 (Strain W 8/37 *Lupinus luteus*)**].  
 Züchter 1940 : 12 : 19-20.

The new mutant differs from the one recorded by Troll and Schander (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 288) in that anthocyanin formation is normal in all parts of the plant. Provisionally the new gene is called *alb*. Hybridization will show whether the *alb* and *niv* genes are identical.

Possible reasons why no white seeded plants have so far been found in strain 80 are suggested. By crossing it should be possible to combine the gene for white seeds with that for the alkaloid free condition found in strain 80.

779. 633.367:633.5  
 MIÈGE, E. 633.367:581.6  
 La production des "lupins doux". Essais entrepris au Maroc. (**The  
 production of "sweet lupins". Experiments undertaken in Morocco**).  
 Rev. Bot. Appl. 1940 : 20 : 16-24.

An article on the "sweet lupin" with special reference to German and other work on its chemical composition and to its uses, not only for human and animal food, but also as a source of fibre. Used as a textile plant 100 kg. of dry stems produce, according to recent Italian research, 10 to 12 kg. of fibre like that obtained from sisal and usable in the same way.

## ROOTS AND TUBERS 633.4

780. 633.41:581.143.26  
 VOSS, J. 633.42:581.143.26  
 Zur Schossauslösung und Prüfung der Schossneigung von Rübensorten  
 (*Beta vulg.* L. und *Brassica Napus* L. var. *Napobrassica* [L.] Reichenb.)  
 (**Inducing bolting and the testing of the tendency to bolting in  
 varieties of *Beta vulgaris* L. and *Brassica Napus* L. var. *Napobrassica*  
 [L.] Reichenb.**).  
 Züchter 1940 : 12 : 34-44, 73-77.

Four factors are considered in relation to bolting in sugar beets, fodder beets and swedes, namely temperature, length of day, manuring and varietal tendency to run to seed. The author's own experiments with different varieties are correlated with the results of other workers and data obtained by official returns on the incidence of bolting throughout Germany. Experimental methods are also considered.

Genetic constitution is recognized (from the work of Roemer and Schneider) as a primary cause of bolting and the writer himself found clear varietal differences in this tendency in swedes.

781. OLSSON, P. A. 633.42-2.412.5-1.521.6:575(48.5)  
 Klumprottsjuka (*Plasmodiophora brassicae* Wor.) på rovor och kålrötter  
 samt åtgärder mot densamma speciellt ur växtförädlings synpunkt. [**Club  
 root disease (*P. brassicae* Wor.) on turnips and swedes and also  
 protective measures to be taken against it especially from the point  
 of view of plant breeding**].

Sverig. Utsädesfören. Tidskr. 1939 : 49 : 4-76.

A full account of the history of the disease, and methods for its control. Special researches have been made in Sweden on the breeding of resistant varieties and details of the progress made are given.

No variety is immune but the Svalöf strain of the Maj Naepe (May turnip), Immuna and 8004, a strain of Dale's Hybrid have shown about 50 per cent. of healthy plants.

There is a bibliography of 63 titles.

782. 633.491:575:578.08  
**Electric lights mature hard-to-get potato seed.**

Market Gr. J. 1940 : 66 : p. 199.

It is reported that H. A. Jones has succeeded in obtaining excellent production of true seed from potatoes in regions where such seed production is not normally satisfactory. The method used was to grow the crop in a greenhouse in the cool season, electric light being used to increase the length of day.

783. \*EMME, H. 633.491:575.127.2  
**(Studies on interspecific hybridization of tuber bearing potatoes  
 sectio *Tuberarium* Bitter, genus *Solanum* L.).**  
 Biologičeskii Žurnal (Biologicheskij Zhurnal) 1938 : 7 : 1093-104.

Sixteen plants were raised from the cross *S. demissum* var. *tlaxpehualcoense* ( $2n = 72$ ) x *S. tenuifilamentum* ( $2n = 36$ ). This was the first time that hybridization using a triploid pollen parent had been successful. Chromosome counts in six of the  $F_1$  plants showed numbers varying from 50 to 60, though one exceptional short lived seedling possessed cells with 18, 19, 36 and 75 to 76 chromosomes.

The seedlings varied in height (some being dwarfs), in leaf dissection, pubescence, photo-periodic reaction and shape of tubers. The violet corolla colour of *S. demissum* was dominant. Although they did not suffer from frost or *Phytophthora* damage the clones were ultimately lost through "degeneration".

A cross between *S. phureja* ( $2n = 24$ ) and the Colorado beetle resisting species *S. Jamesii* ( $2n = 24$ ) was also made and although reduction division in the hybrids was normal, no fruit was set. The ease with which these two members of the *Rotata* and *Stellata* respectively will hybridize is said to indicate that the species in the section *Tuberarium* are relatively young.

Hybrids were also produced from crosses between *S. gibberulosum*, *S. Knappei* and *S. Schickii* (all 24 chromosome species). These species possess corollas with short, ill-defined "shoulders" and high acumen; Juzepczuk considers this to be a primitive character and on the basis of the distribution of these species we should expect the area of the Argentine-Bolivian frontier to have been the primary centre of origin of tuberous *Solanum* species.

T. A. Votčel's experiments show that the alcohol yield is fairly high in *S. Schickii* and *S. gibberulosum*, indicating good starch quality—of possible use in breeding.

784. ARNAUTOV, V. V. 633.491:575.322  
**(Transmutation of the potato plant by controlled nutrition).**  
 Ovošćevodstvo (Vegetable Growing) 1939 : No. 12 : 24-26.

Differences in yield, earliness and starch content were noted in crops from tubers grown under different conditions of fertility and this is claimed as contrary to Mendelian theory.

785. OSTANIN, S. N. 633.491:581.6  
**(The biochemical characteristics of starch of new species and  
 varieties of potatoes).**

Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : No. 2 : 26-30.

Differences were observed in the rate at which the starch turned to sugar, though the differences

\* An abridged translation of this paper is on file at the Bureau.

between varieties and even between species were not very marked. *S. andigenum* had a higher salt and phosphorus content than *S. tuberosum* varieties, the two being correlated. Differences were observed in the refractive index of the starch solution, its viscosity and the temperature of gelatinization.

786. CLARK, C. F.,  
LOMBARD, P. M. and  
WHITEMAN, E. F. 633.491:581.6:578.08:575  
**Cooking quality of the potato as measured by specific gravity.**  
Amer. Potato J. 1940 : 17 : 38-45.

It is concluded that the determination of specific gravity by flotation in salt solutions of known density is a useful method of making a preliminary selection for mealiness among potato seedlings. A highly significant interaction between seasons and mealiness shows, however, that a single season's tests would not be sufficient for fully reliable results.

787. CHEVALIER, A. 633.491:582(7+8)  
Les espèces de *Solanum* cultivées venues du Nouveau-Monde. Les  
origines et les résultats de leur culture. (**The cultivated species of  
*Solanum* from the New World. Origins and results of their cultiva-  
tion**).  
Rev. Bot. Appl. 1939 : 19 : 825-35.

A review of the main cultivated groups of *Solanum* in America, the conditions of their acclimatization in other countries and the uses of the various species.

788. SCHLUMBERGER. 633.491-2.3-1.521.6(43)  
Kartoffelsortenprüfung auf Schorf widerstandsfähigkeit 1939. (**Testing  
potato varieties for scab resistance 1939**).  
Mitt. Landw. 1940 : 55 : 9-11.

An account of the most promising varieties undergoing tests for scab resistance in Germany. Carnea may be regarded as practically immune and Akebia as fairly resistant. Other promising varieties were: Kamecke's 15/23, Knehden Nos 2106 and 874, Lochow 31 201, Pfetten 39 39 and Nordost 38/31/6, the last named being in addition an early variety and therefore of considerable interest.

American work on breeding for resistance to scab and on physiological forms of *Actinomyces scabies* is mentioned.

789. BARABANOV, P. N. and  
PIUNOWSKY, I. M. 633.491-2.8-1.521.6:575(47)  
(**New sorts of potatoes in the B.S.S.R.**).  
Ann. White Russian Agric. Inst., Gorki 1939 : 10(32) : 59-66.

A description is given of the variety Lorkh (Świtez x Fürstenkrone) which is said to be resistant to virus diseases and somewhat resistant to blight; it is high in yield and the tubers are large and of high quality. The variety Kollektivnyi (Kriemhilde x Fürstenkrone) is also described; it is a high yielding industrial variety and also said to be resistant to virus.

790. PEELING, B. A. 633.492:575(75.7)  
**Breeding new sweet potatoes sexually.**  
Agrarian, Clemson, S.C. 1939 : 1 : No. 2 : p. 13.

A sweet potato breeding scheme is being conducted at the Clemson Agricultural College, South Carolina, by J. B. Edmond. Some 500 cross-pollinations were made in the autumn of 1938, of which only 12 produced seed. Flowering in the parent plants is artificially induced.

## FIBRES 633.5

791. PITTERY, R. and  
ENGELBEEN, M. 633.51:519.24:631.421  
Note sur l'expérimentation cotonnière. (**Note on cotton experimenta-  
tion**).  
Rapport Annuel pour l'Exercice 1938 (2me Partie) Publ. Inst. Agron.  
Congo Belge 1939 : Hors Sér. : 129-56.

The statistical basis of trials and experiments with cotton is explained for the instruction of those wishing to conduct experiments.

792. ZHEBRAK, A. R. and RZAEV, M. M. 633.51:575.127.2:576.356.5:581.04  
633.11:575.127.2:576.356.5:581.04  
**Mass production of amphidiploids by colchicine treatment in cotton.**  
C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 26 : 159-62.

Amphidiploid plants or amphidiploid sectors were produced by colchicine treatment of the seeds or shoot apices in the following *Gossypium* crosses: *G. hirsutum* x *G. Sturtii*, *G. hirsutum* x *G. Armourianum*, *G. herbaceum* x *G. anomalum*, *G. hirsutum* x *G. barbadense*, *G. hirsutum* x *G. arboreum* and *G. hirsutum* x *G. Stocksii*. The usual inverse relationship between the fertility of the  $F_1$  and of the amphidiploid was observed.

It is also noted that an amphidiploid *Triticum polonicum* x *T. durum* ( $2n = 56$ ) was obtained by Zhebrak. It set only single grains per ear in the  $F_2$ , though a higher set was obtained by pollinating with the *T. vulgare* variety Marquis.

793. HUMPHREY, L. M. 633.51:575.14-181.12:575  
633.51:519.241.1:581.6  
**Effects of inbreeding cotton with special reference to staple length and lint percentage.**

Bull. Ark. Agric. Exp. Sta. 1940 : No. 387 : Pp. 16.

This paper is similar in substance to the abstract summarized in "Plant Breeding Abstracts", Vol. X, Abst. 491. It is noted that six lines of the Rowden variety inbred for seven years were superior to all of the established Arkansas varieties in tests during 1938.

794. NEWCOMBE, H. B. 633.51:576.16:582  
**A note on the relation of *Gossypium Raimondii* Ulbrich to other American species.**  
J. Hered. 1939 : 30 : p. 530.

A brief note on the taxonomic relationships of the 13-chromosome cotton species (cf. "Plant Breeding Abstracts", Vol. X, Abst. 289).

795. BEASLEY, J. O. 633.51:576.356.5:581.04  
**The production of polyploids in *Gossypium*.**  
J. Hered. 1940 : 31 : 39-48.

A wide range of polyploids was produced in *Gossypium* by immersing apical meristems in 0.2% colchicine solution for 24 hours and a single example was also obtained by low temperature treatment.

Autotetraploid *G. herbaceum* showed typical *gigas* characters but was male-sterile. Autotetraploids of *G. hirsutum* and *G. barbadense* were also normally male-sterile, though there were sometimes a few viable pollen grains.

Tetraploids from *G. herbaceum* x *G. arboreum* var. *neglectum*, two closely related cultivated Asiatic species, had a low percentage of apparently viable pollen.

Hexaploids from *G. hirsutum* x *G. herbaceum* and from *G. hirsutum* x *G. arboreum* var. *neglectum* were fertile, with 65 and 85%, respectively of normal pollen. The flowers of these types were longer than in the corresponding triploids. There were fewer seeds than in the better Upland varieties. The fibre length of the *hirsutum-herbaceum* hexaploid was 29 mm. as compared with 27 mm. and 20 mm. for the parents. In growth and flowering habit the hexaploids resembled Upland cottons.

*G. barbadense* x *G. herbaceum* hexaploids had only 30% of good pollen. Hexaploids from the cross *G. hirsutum* x *G. Harknessii* (a wild 13-chromosome American species) had about 80% of good pollen and had light brown lint less dense and slightly shorter than in *G. hirsutum*.

Hexaploids from *G. hirsutum* x *G. Sturtii* (a wild Australian diploid) had 85% of good pollen. Many of the *G. Sturtii* characters were dominant. The fibres were slightly shorter than those of the American parent.

Octoploids obtained from *G. hirsutum* x *G. barbadense* variety Pima had anthers that usually failed to dehisce. They showed the hybrid vigour of the tetraploid  $F_1$ ; the leaves, however, were wrinkled and coarser, with a darker green colour and larger epidermal hairs. Fibre length averaged 41 mm. as compared with 35 mm. for the  $F_1$ , 22 mm. for *G. hirsutum* and 41 mm. for Pima. Octoploids involving the Sea Island variety Bleak Hall instead of Pima had a larger number of dehiscing anthers.

Tetraploids from *G. arboreum* var. *neglectum* x *G. Thurberi* rarely had viable pollen but had high ovule fertility when crossed with 26-chromosome American pollen.

In addition, pure lines of *G. hirsutum* and *G. barbadense* were obtained by doubling the chromosome number in haploids.

The fertility relations of many of the above polyploids when crossed to the parent or other species are recorded and the possibility of using polyploids in practical breeding briefly discussed.

796. 633.51:576.356.5:581.04

KASPARYAN, A. S.

633.51:575.129

**A colchicine-induced amphidiploid - Upland x Egyptian cotton (*Gossypium hirsutum* L. x *G. barbadense* L.).**

C.R. (Doklady) Acad. Sci. U.R.S.S. 1940 : 26 : 163-65.

Chromosome doubling was successfully induced in  $F_1$  *G. hirsutum* x *G. barbadense* by colchicine treatment. The amphidiploid plants were late in flowering and few flowers were obtained. Very few good pollen grains were formed but they were uniform and large in size. Some seeds were set. The amphidiploid plants showed the usual morphological characteristics of polyploids.

797. SMITH, H. P.,

KILLOUGH, D. T.,

JONES, D. L. and

BYROM, M. H.

633.51-1.556:575(76.4)

**Mechanical harvesting of cotton as affected by varietal characteristics and other factors.**

Bull. Tex. Agric. Exp. Sta. 1939 : No. 580 : Pp. 49.

The characteristics which determine the suitability of a cotton variety for mechanical harvesting are discussed at length and various relevant field experiments conducted in Texas are reported. The ideal type appears to be a plant with relatively short but numerous fruiting branches with short nodes, no vegetative branches, an open type of growth, light foliage, moderate storm resistance and large, strong bolls borne singly, with a peduncle which will snap easily under tension but which will stand considerable plant agitation. Selections along these lines are being made.

798. 633.52:575(43.7)

TOBYÁŠ, J.

633.522:575(43.7)

**Zlepšení odrůd lnu a konopí ve výtěžnosti vlákna a oleje zušlechťováním. (Improvement by breeding of varieties of flax and hemp in respect of productiveness of the fibres and of oil).**

Časové Otáz. Zeměd. 1937 : 66 : 31-37.

This is a report of the breeding work in fibre plants (flax and hemp) undertaken at the breeding station at Domaninek, Czechoslovakia. The chief breeding aims in flax are the following: increasing the height of the stem, leading to a greater productiveness of the fibre for spinning purposes; improvements of the quality of the fibre; increasing the amount of seeds produced. Other features which are of interest for the breeder are earliness, resistance to diseases, frost and drought, as well as stiffness of the stem to prevent lodging.

Strains belonging to the following varieties were used: Hohenheim blue flowered flax, Mathis Edelflachs, Meder F 496, Irsky IWS. The method of individual selection led to the production of a number of forms differing with regard to height of stems, value of the fibre, productiveness of seeds, earliness, etc. Meder F 496 was used as the standard variety. The most important result of the selection seems to consist in the development of strains with relatively tall stems which produce a high quantity of seeds of good quality. Crosses between oil and fibre types were carried out with the aim of obtaining an intermediate dual purpose form.

Preliminary breeding work in hemp has also been started.

M. S.

799. 633.52:575(49.2+49.3)

GRANHALL, I.

633.52-2.8-1.521.6(49.2+49.3)

**Linodling och linberedning i Belgien och Holland. (Flax cultivation and processing in Belgium and Holland).**

Sverig. Utsädesfören. Tidskr. 1939 : 49 : 405-22.

The first part of this paper contains a section dealing with the improved flax varieties produced by the Wageningen Institute for Plant Breeding such as Concurrent (the most popular selection in Holland) which is a white flowered vigorous type with a medium long stem of unusually

uniform length and showing good resistance to lodging. The quality of the fibre has in recent years been subjected to some criticism.

The 1939 Wageningen list of strains which have been approved or are undergoing tests also includes Svalöfs Blenda and Herkules, Postma's Blauwe Ster and the Irish variety Liral Crown; the Friesian white flowered flax (a land variety) is losing its importance. Blenda has aroused considerable interest in Holland by its fibre quality, and Herkules by its resistance to "linbrand" [= "brûlure"].

Among other products of the Institute's workers are the Unica green pea which is now widely grown and the two flax varieties produced by P. J. Hijlkema, Gloria (G.1038) and Resistenta (R.1138) which shows good resistance to "brûlure". The same investigator has also some new lines which are being studied, derived from the hybrid series F.6 (from Dr Dorst) x Texala (from Wageningen) and Concurrent x F.6.

In addition to its functions in regard to education and research the Wageningen Institute organises and assists the work of private plant breeders in Holland. Comparative trials of wheat and flax (including several promising new lines) are being conducted by the Institute. Flax improvement is receiving attention, especially from the technical side, and a Committee for the Study of Flax (Vlas-Studie Commissie) has been established to deal with industrial, agricultural and research problems affecting flax.

The author also records the work and functions of the Research Station for Plant Improvement (Station de Recherches pour l'Amélioration des Plantes) at Gembloux with reference to flax breeding. The strain Gembloux 32, now released for large scale trials is of the Blenda type with long straw and good quality fibre. In yield trials the variety Herkules proved especially resistant to "brûlure". Concurrent and Hijlkema's variety Resistenta were also resistant; but Rota (Latvia), Blauwe Ster and Hohenheimer Blau (Germany) were severely attacked.

800.

ELLADI, K. V.

633.52:575"793"

633.52:581.143.26:575.11

(Inheritance of length of vegetative period in flax hybrids).

Bull. Acad. Sci. U.R.S.S., Sér. Biol. 1939 : 371-88.

Crosses were made between 34 cultivated and one wild form of *Linum*, representing sixteen different ecological types; 200 combinations were made and studied in the  $F_1$ ,  $F_2$  and  $F_3$ , 60,000 plants in all having been examined.

The  $F_1$  was intermediate in 51.5% of the cases, equal to the early parent in 35.5, earlier in 11.30 and equal to the late parent in 1.7% of the cases (three crosses only). The intermediate  $F_1$  plants were also intermediate in habit. Dominance of earliness occurred in those crosses where one of the parents had a short thermo-stage of vernalization, this dominance being observed only when growing conditions were such as to supply sufficient low temperature to effect this thermo-stage. Transgression of earliness occurred in crosses between late forms phasically complementary.

Observations on the  $F_2$  from an  $F_1$  dominant for earliness showed the majority of the plants to be also early, some transgressing the early parent. The majority of  $F_2$  plants from an intermediate  $F_1$  however were intermediate and those from the  $F_1$ s where lateness was dominant were late or intermediate. It was common to find plants among the  $F_2$  that exceeded the  $F_1$  in earliness of flowering by as much as 10 to 12 days and in maturity by 7 to 8 days, the proportion of these varying in different crosses. Again in the  $F_3$  many forms earlier than any plant in the  $F_1$  or  $F_2$  were detected.

801.

MUDRA, A.

633.522:576.356.5

Tetraploide Mitosen beim Hanf. (Tetraploid mitoses in hemp).

Bul. Fac. Agron. Cluj 1939 : 8 : 269-72.

Examinations of hemp root tips showed that not all periblem cells were tetraploid—some were diploid; also tetraploid cells were not confined to periblem tissue but were also found in the stelar portion. The ratio between the frequency of diploid and polyploid mitoses differs according to the geographical source of the sample; and it would seem that the percentage of tetraploid mitoses increased as the source of the sample became more northerly. From investigations of a few samples no irregularities could be detected in meiosis.

The relation between geographical adaptation and cytological behaviour must be interpreted with caution and due regard to the true origin of the particular hemp in question.

802. BELOVITSSKAYA, N. A. and  
GRECHUKHIN, E. I.

633.522:577.8

**(On the monoecious hemp).**

Bull Acad. Sci. U.R.S.S., Sér. Biol. 1939 : 311-34.

Monoecious plants bearing male, female and hermaphrodite flowers have been found in numerous hemp samples examined, the proportions being different in different plants. The type of plant may also incline in varying degrees to the male or the female type, so that "masculinized female" and "feminized male" are referred to, as well as the ordinary male and female intersexes, of which they are a further degree. Different geographical races differ in the type of intersex that predominates.

Very few monoecious forms appeared in the progeny of open-pollinated monoecious plants but in the second and third generations segregation occurred for sex, size of seed and various morphological features not correlated with sex expression. Flowering of the masculinized female intersexes coincides with that of the male plants but is of very short duration. Self and a certain amount of cross sterility was observed in some of the monoecious plants, particularly in the hermaphrodite flowers.

The proportion of the different sex types varied in the progeny of different plants, the female flowers producing a higher proportion of forms ranging towards the female type. The same was true in progenies obtained by crossing female plants or female intersexes with feminized males and by repeated back-crossing to the female the male forms have been almost eliminated. Crossing masculinized females with male and with masculinized intersexes gave monoecious masculinized female, female and male plants, the latter in reduced proportions.

By selecting feminized male forms over 3 to 4 generations it has been possible to produce strains in which the male plants mature simultaneously with the females, which is a great advantage for mechanical harvesting; they are also characterized by stronger but shorter fibres, the feminized males resembling the females in fibre characters.

Monoecious habit being a recessive character, the proportion of monoecious plants tends to be greater in the third and later generations of a cross than in the  $F_2$ . Large proportions of monoecious individuals have been observed in the later generations even of crosses between pure male and female plants when these were of different geographical origin.

These experiments show that the tendency to give sex variations is inherited, hereditary and environmental influences being both concerned in the final expression of the sex form.

803. HOFFMANN, W. and  
KNAPP, E.

633.522:577.8:537.531

**Röntgenbestrahlungen beim Hanf. (X-ray irradiations with hemp).**

Züchter 1940 : 12 : 1-9.

Induction of mutation in hemp by X-rays was carried out in hopes of affecting the sex ratio in such a way as to obtain a constant monoecious strain. Though this object was not attained the following results are of interest:—

As the X-ray dosage increased the number of surviving mature plants decreased and the number of female plants increased, the sex ratio in one experiment being 61.1% ♀♀: 33.5% ♂♂ as compared with 52.4% ♀♀: 47.5% ♂♂ in the control. Possible causes of this alteration in the sex ratio are considered.

Forking of the stem as a result of irradiation and also other aberrations, including the occurrence of monoecious forms and "masculinized female" forms, appeared to increase with the X-ray dosage. The forked stem portions were in some cases female and male, in others typical female in conjunction with a "masculinized female."

The authors hope ultimately to be able to evolve a constant monoecious strain from a dioecious one.

804. TIFLOVA, A. M.

633.522:581.162:575:577.8

**(Breeding simultaneous ripening hemp of the "masculinized" type).**

Len i Konoplja (Flax and Hemp) 1939 : Nos 10-11 : 42-44.

Female plants deviating in the direction of maleness were selected in succeeding generations and the proportion of them was found to rise progressively, so that 44 families have now been obtained in which the entire population consists of the "masculinized" type. The plants are 10 to 50 cm. taller than the normal female plants and have a longer growing period. In some of the families the plants flowered and matured simultaneously with the male plants. Selection is now being carried out for freedom from shedding, which is one of the main defects

of the type at the moment. It has given a 15% greater yield of straw and a higher percentage of total and of long fibres.

805. 633.524.33  
 Observations sur les essais d'*Urena lobata* à la station expérimentale de l'Inéac à M'Vuazi. (**Observations on the tests of *U. lobata* at the Inéac Experimental Station at M'Vuazi**).  
 Agric. Elev. Congo Belge 1940 : 14 : 19-20.

*U. lobata* (used as a source of fibre) is being studied from the point of view of (1) methods of sowing, (2) mass selection, (3) lines obtained and (4) progenies from selfings. Results of interest to plant breeders will be published in the annual report.

806. 633 524.34:575.127.2:581.162.5:576.356  
 MEDWEDEWA, G. B.  
 (Cytological investigation of hybrids of *Abutilon avicennae* Gaertn.  
 x *A. indicum* Sweet.)  
 Biologičeskii Žurnal (Biologicheskij Zhurnal) 1938 : 7 : 1105-20.

The hybrids were intermediate in most characters but were of very much reduced fertility, no seed being obtained from selfing or from pollinations with either of the parent species. A few seeds were obtained from open pollination.

Cytological examination of the parents showed both species to have  $2n = 42$ , the chromosomes being of essentially similar type; meiosis was regular. In the hybrids part or all of the nuclear material of the pollen mother cells was frequently seen to migrate into the adjacent cell; such cells in most cases degenerated. Many of the chromosomes did not conjugate and those that did rarely or never formed more than one chiasma; the maximum number of bivalents observed was 18, the minimum 12. Even those chromosomes that failed to pair were, it is noted, arranged together in pairs. Chromosome separation was somewhat irregular but not excessively so; daughter cells were formed in the ordinary way and no case was observed of the production of supernumerary nuclei or restitution nuclei, tetrad formation being in most cases normal. Degeneration set in later during the formation of the pollen grains, which at maturity were mostly empty; only 15% of them showed coloration when treated with iodine. Other hybrids are cited from the literature in illustration of the lack of correspondence between the degree of meiotic irregularity and sterility.

It is thought that unfavourable conditions of growth may be partly responsible for the sterility and that it could be partially overcome by growing the hybrids under optimum conditions, at least at the time of flowering.

## SUGAR PLANTS 633.6

807. 633.61:581.331.2  
 GONDŌ, A. 633.61:575:578.08  
 (Pollen studies of sugar cane II. Pollen preservation 1).  
 Agric. and Hort., Japan 1939 : 14 : 2673-84.

It is concluded that sugar cane pollen may best be preserved in an atmosphere with vapour pressure corresponding to the suction pressure of the grains (i.e. over a 1.2M solution of KCl in the author's experiments). The temperature relations were complex but in a saturated atmosphere 3° C was better than 0° or 10°. Pollen grains were still capable of germinating (though to a decreased extent) after 13 days of storage at 0° C in an atmosphere of 100% relative humidity.

808. 633.63:575.12:633.416  
 BOUGY, E.  
 Fluctuations dans les hybrides des betteraves fourragères et sucrières.  
 (Fluctuations in the hybrids between forage and sugar beets).  
 Bull. Ass. Chim. Sucr. 1939 : 305-12.

Hybrids between Vilmorin A sugar beet and Géante de Vauriac mangel have a sugar content considerably higher than the mean of the two parents. Studies were made of hybrids in all possible combinations from four forms of Vauriac pollinated by three of Vilmorin A. There was variation in the root shape of the hybrids and the ovoid roots, which generally weighed more, had a lower sugar content than the conical forms.

Some hybrids from one of the sugar beets were yellow, all the others were red. One particular sugar beet produced hybrids with higher sugar content than the others, the mean for the progeny of this beet being 15% dry matter as compared with 14 for the remainder;

some pollen parents also produced better offspring than others, the influence of the pollen parent being, in the opinion of the author, more pronounced than that of the maternal parent. The roots from the reciprocal hybrids Vilmorin A x Vauriac were slightly smaller and more conical. Their dry matter content was also lower, varying from 13.2 to 15.0%. There was a close correspondence in the values of the progenies of the different Vauriac plants with reciprocal and direct crosses.

809. ARKHIMOVICH, A. 633.63:578.08:575

(A new type of isolator for groups of beetroot plantings).

J. Inst. Bot. Acad. Sci. Ukraine 1940 : No. 23(31) : 167-75.

The isolator referred to in "Plant Breeding Abstracts", Vol. IX, Abst. 801 has been simplified, since it was found that continuous water cooling was unnecessary. Intermittent water cooling only on especially hot days was found to be sufficient to give a substantial yield of seed. Some reduction in yield was experienced, however, the figure obtained being 58% of the seed yield in the open.

## STIMULANTS 633.7

810. KAZNOWSKI, L. 633.71:575(43.8)

Problèmes fondamentaux de la sélection du tabac. (Fundamental problems of tobacco selection).

Tabac, Rome 1939 : 2 : No. 2 : 81-83. Also in German pp. 84-86.

The more important aims of Polish tobacco breeders prior to the war are outlined. They include the acclimatization of foreign varieties and their adaptation to the needs of local growers, e.g. the production of Kentucky and Virginia types with vigorous early growth; the production of varieties resistant to diseases and pests; the improvement of aroma and colour; and the production of types with different nicotine contents, of improved plant habit and greater ease of curing.

811. 633.71:575(47)

(Symposium on breeding, genetics and seed production of tobacco and *Nicotiana rustica*).

Vsesojuznyi Naučno-Issledovatel'skii Institut Tabačnoi i Makhoročnoi Promyšlennosti imeni A. I. Mikojana (VITIM) (All-Union Mikojan Research Institute of the Tobacco and Makhorka Industry) Krasnodar 1939 : No. 139 : Pp. 275.

The symposium contains the following articles of interest to plant breeders:

Ternovsky, M. F. (Ways of accelerating the breeding process of tobacco and makhorka). (pp. 3-21).

By pollinating complex hybrids with some other species such as *Nicotiana alata*, *N. Sanderae* or *N. glutinosa*, true-breeding progeny are produced with great frequency by diploid parthenogenesis. In reviewing the factors that make for efficient breeding the author refers to the importance of a suitable choice of parental material, and of working with sufficiently large breeding populations, it being shown that with 10 pairs of allelomorphs only 0.0001 of the individuals in the  $F_2$  population are homozygous for all the desired characters—thus over a million plants would be necessary to produce one desirable homozygote. This number can be materially reduced by the use of the method of repeated back-crosses. By this method even with 20 pairs of segregating genes it is possible to make selections in the  $F_4$  or  $F_5$  generations. If the desired characters are found in three or more distinct varieties the method recommended is to cross the  $F_1$  of the first two with the third or its hybrid and proceed to select in the progeny.

Many characters of the tobacco plant can be judged in the young plant stage and some selection can profitably be carried out at the transplanting stage, e.g. for such characters as growth rate (which is correlated with resistance to root rot), colour of leaves, presence of petiole and disease resistance. Other means of speeding up breeding work are the preliminary multiplication of the material while still under trial, enlisting the co-operation of the growers, and growing two and more generations a year; the technique of this is described in some detail. Both long-day and short-day varieties have been discovered, as well as a group of neutral forms. It is now claimed to be possible to produce new varieties in  $2\frac{1}{2}$  to  $3\frac{1}{2}$  years and a new mosaic resistant form of Dubec has actually been bred in three years by interspecific crossing.

Bolsunov, I. I.

[Trials of new breeding makhorka (*N. rustica*) varieties]. (pp. 32-43).

The old standard variety of *N. rustica*, Klmelovka, has been surpassed in both yield and quality by a number of varieties produced by Soviet breeders. These varieties are enumerated, their relative content of nicotine and of citric acid being also indicated. Some of the new varieties have a nicotine content of 14 to 18% in the leaves and, though low in yield, have the advantage of being very early maturing.

Bolsunov, I. I.

(Contribution to the study of hybrid vigour in *Nicotiana rustica* L. III. Dynamics of hybrid growth). (pp. 44-57).

The number of hybrid combinations showing heterosis in the early growth stages was consistently greater than the number showing it in the later stages. The degree of heterosis also diminished progressively, but varied greatly according to the conditions of growth. Hybrids whose growth rate is much higher in the early stages are frequently level with or in some cases even below the parents at the end of the growing season.

No differences were observed in the behaviour of reciprocal crosses. No correlation could be observed between heterosis and the weight of the hybrid seed. Comparison of plant height at different periods of development showed that in many cases the phenomenon of hybrid vigour in the early stages was merely an expression of the dominance of tallness from the one parent and earliness from the other.

Bolsunov, I. I.

(Contribution to the study of hybrid vigour. Relation of plant parts in yield). (pp. 58-68).

Hybrid vigour as regards plant development was observed in 30% of the 99 crosses studied and as regards yield of seed in 20%; the number of crosses in which the hybrid exceeded the better parent by 20% or more in height or in yield of dried leaves and stem was almost 10%. Very few of the hybrids showed heterosis in both plant and seed, those showing the one having usually not shown the other. Similarly as regards vegetative development, some hybrids were superior in both height and yield of leaves but the majority in one or other but not in both; and again, stem yield more frequently showed heterosis than leaf yield. None of the hybrids examined showed any heterosis as regards root development and, possibly in consequence of this, many of them suffered more than the parents in times of drought.

Psareva, E. N.

(Characteristics of midrib thickness in *Trebizond tobaccos*). (pp. 77-87).

The thickness of the leaf midrib is shown to be a hereditary varietal character and the choice of forms with reduced midrib is recommended in selection and hybridization work.

Boortzev, G. A.

(Genetical investigation of leaf colour and some characters correlated with it in *Nicotiana rustica* species). (pp. 88-103).

Bifactorial segregation was observed in crosses between green and yellow leaved forms, with green dominant, different shades being apparently determined by modifiers; the results were confirmed in the  $F_3$ . The colour of other organs of the plant such as the petioles, corolla, ovary and capsules is influenced by the same two main genes but not by the modifiers. The purple colour of the corolla and ovary of some varieties is determined by a further dominant gene *C*, independent of the other two.

Boortzev, G. A.

(Inheritance of leaf colour in tobacco). (pp. 104-06).

In some crosses a dihybrid ratio of green to yellow was obtained, with green dominant, but in other crosses there was a notable deficiency of yellow segregates in the  $F_2$ . This is explained by their lower vitality in the seedling stage and their greater susceptibility to root rot.

Boortzev, G. A.

(Genetical investigation of seed colour and some characters correlated with it in *Nicotiana rustica* species). (pp. 107-30).

The seeds of *N. rustica* are very high in oil content and consequently of great industrial value. The white seeds have a higher oil content than coloured seeds.

In crosses of the white seeded variety R 72 with dark seeded varieties the  $F_1$  was identical with the latter. In  $F_2$  there was monohybrid segregation, with a deficiency of the recessive white forms. A similar deficiency, though to a lower degree, was observed in back-crosses with the recessive parent, the proportions being the same when the recessive and when the  $F_1$

was used as female parent. From this it is concluded that the effect is due either (1) to a lower viability of the recessive gametes or (2) to the fact that seed colour is conditioned by two genes linked in the same chromosome, with a certain amount of crossing-over leading to the excess of coloured segregates.

A cross-over percentage of 4.35 was observed between seed colour and compact habit.

*Ternovsky, M. F.*                      (*Amphidiploid N. Tabacum L. x N. sylvestris Spæg.  
et Comes*). (pp. 131-44).

Among 4,724  $F_1$  plants of the cross *N. Tabacum* x *N. sylvestris* one proved to be fairly fertile; except for the larger size of the flowers the plant was similar to the other, sterile, hybrids. Its root tips and some of the lower shoots had 36 chromosomes but the fertile shoots had  $2n = 72$ ; in these shoots meiosis was on the whole regular, occasional quadrivalents being formed. A little over 12% of the tetrads contained micro-nuclei and although 97.2% of the pollen was well filled its germination was decidedly inferior to that of the parent species.

The plant giving rise to the amphidiploid had been subjected to a temperature of 40 to 46° C 4 to 6 days after pollination and this treatment is thought to have induced the chromosome duplication.

The amphidiploid was pollinated with *N. Rusbyi*, with which it was fertile, producing hybrids with 24 bivalents. It is thought to be useful for crossing purposes for the production of highly aromatic forms.

*Sarana, M. O.*                      (*Polygenom hybrid N. glauca x N. Tabacum and N.  
Tabacum x N. glauca*). (pp. 145-97).

In the  $F_1$  of *N. Tabacum* x *N. glauca* the chromosomes of the two species could be distinguished morphologically; nevertheless they conjugated and sometimes up to 24 bivalents were formed. Occasional trivalents were observed, some of them being apparently formed entirely from chromosomes of *N. glauca*. The hybrids were however very low in fertility. One amphidiploid with  $2n = 70$  to 72 was obtained by open pollination but died at an early stage. Another plant produced a certain number of fertile, amphidiploid shoots, in which the flowers were larger and had anthers equal to the stigma in height. The leaves were thicker and coarser and shed at maturity, the plants were more winter-hardy than *N. Tabacum*; their seeds were larger but very much less numerous; they crossed with the parental and other species when used as maternal parent. Various meiotic irregularities were observed in the amphidiploid and are described; though the greater part of the gametes had 36 chromosomes, the numbers 33, 34, 35, 37, 38 and 39 were also observed. The chromosome number and plant type in the progeny also showed considerable variation and there were some chromosomal irregularities. Certain aberrant plants showing a greater resemblance to *N. Tabacum* are thought to have resulted from crossing-over between chromosomes of the two species.

Pollination of the amphidiploid with *N. glauca* gave rise to trigenom hybrids with two *glauca* and one *Tabacum* genomes, showing a still greater resemblance to *N. glauca* and almost completely sterile. The hybrids had  $2n = 48$  or, in one case, 47. The meiotic irregularities in these hybrids, which are described, include the pairing of *Tabacum* chromosomes among themselves or with *glauca* chromosomes to form trivalents and the formation of dyads, pentads and hexads.

The amphidiploid was pollinated with *N. Tabacum* and produced the other type of trigenom hybrid (2T + 1g), two plants of which had  $2n = 60$  and one  $2n = 58$ ; the plants showed a greater resemblance to *N. Tabacum* and were of reduced fertility. Trivalents of various types were observed, and univalents, some being clearly chromosomes of *N. glauca*, others *N. Tabacum*; dyads, pentads and hexads were also formed. The behaviour of these hybrids was similar to that of certain naturally occurring hybrids of the same type. When pollinated by *N. Tabacum* eleven seeds were produced and gave rise to seven plants, most of them resembling *N. Tabacum* in all but a few details. Their chromosome numbers varied from 50 to 56; the chromosomes of the two species were clearly distinguishable, except in certain cases where an interchange seemed to have taken place.

Pollination of the trigenom hybrid (2T + 1g) with *N. glauca* gave rise to plants closely resembling *N. glauca*. One such plant had  $2n = 69$ . Trivalents, quadrivalents and univalents were observed as well as bivalents and pentads, hexads and even decads were formed. The progeny of this plant was fairly uniform but some were free from anthocyanin and had leaves that did not fall off at maturity, being therefore possibly of practical value. Most plants had a high

proportion of good pollen and produced up to 400 seeds per capsule. Their chromosome numbers varied from 65 to 70.

Great variation was observed in the plants produced by the trigenom hybrid by open pollination, segregation occurring in pigmentation, leaf form and a number of other characters. Some of the plants promise to be of practical value especially in respect of cold resistance. Their chromosome number varied between 47 and 58, meiosis was irregular and fertility varied from rather low to fairly high.

A four-genom hybrid (3T + 1g) was also found in the  $F_1$  of *N. Tabacum* x *N. glauca*. It showed more resemblance to *N. Tabacum* than the ordinary  $F_1$  but was of low fertility. Its somatic chromosome number was 84; many trivalents were observed, and also univalents and quadrivalents consisting of 3 *Tabacum* and 1 *glauca* chromosomes. Plants obtained from it varied in chromosome number from 49 to 71 and varied also in type and in fertility.

In the discussion emphasis is laid upon the meiotic irregularities observed in the amphidiploid, which are ascribed to cytoplasmic incompatibility, and upon the resultant segregation in the selfed and back-cross progeny, similar observations being cited from a number of other authors. The alkaloid of the amphidiploid has been shown to differ from that of the parents and the importance of amphidiploidy as an evolutionary factor is unquestioned. The chromosomal irregularities observed in the amphidiploid may even account for the origin of the aneuploid series existing in many plant species.

Žukov, N. I. (Cytological investigation of meiosis in some *Orobanchaceae* species). (pp. 198–207).

In *O. ramosa* L. 12 bivalents were observed as a rule, though most of the meioses examined presented slight irregularities of some kind, dyads were occasionally formed and the percentage of good pollen was only 72%.

Meiosis was regular in *O. cumana*, *O. aegyptiaca*, with 12 bivalents and in *O. lutea* with 19.

Žukov, N. I. (Sesquidiploids *Nicotiana rustica* x *N. Tabacum* and the inheritance of nicotine, anabasine and citric acid in crosses with *N. glauca*). (pp. 208–23).

Flowers of the hybrid *N. rustica* x *N. Tabacum* were subjected to high temperature treatment and pollinated with the parental form of *N. Tabacum*, from which 5 plants were obtained. All proved to be sesquidiploids with 1 *rustica* and 2 *Tabacum* genomes, they were more luxuriant in growth than the parental species but in type showed most resemblance to *N. Tabacum*. All had  $2n = 72$ . Some of the *N. rustica* chromosomes conjugate with the *N. Tabacum* bivalents to form trivalents, others remain as univalents; various meiotic irregularities are described.

The sesquidiploids were self-sterile but when crossed with *N. glauca* produced a number of plants of very varied type but all of low fertility; they contained no nicotine but contained anabasine in quantities often exceeding that found in pure *N. glauca*, which contains a maximum of 0.85%, whilst the hybrids contained up to 1.9%, with an average of 0.96%. They also contained citric acid, though in proportions less than in *N. glauca*. There was no correlation between anabasine and citric acid content.

Žukov, N. I. (*Nicotiana rustica* L. haploids). (pp. 224–35).

Races of *N. rustica* differ in the ease with which they cross with *N. glauca* and those that cross least readily show a greater tendency to produce haploids instead. The haploids are described. Their leaves were smaller and stems thinner, their flowers were smaller and their nicotine content distinctly lower than in the corresponding diploids. All the haploid plants examined had 24 chromosomes, most or all of which remained unpaired at meiosis, which is accomplished with the usual irregularities. The proportion of good pollen was 3 to 4% and the plants were self-sterile. Seeds were set by open pollination and crossing with *N. rustica* produced a certain number of plants with  $2n = 48$ , evidently arising from unreduced gametes of the haploid.

Žukov, N. I. (*Nicotiana rustica* x *N. alata* hybrids). (pp. 236–44).

The two species belong to different sections and are difficult to cross. Thirteen capsules were obtained, containing 156 seeds, of which however only five gave rise to mature plants, all smaller than either of the parents and with 33 somatic chromosomes. Marked meiotic irregularities were observed, including the omission of the heterotypic division and the formation of sex cells with the somatic chromosome number; both dyads and monads were observed.

Only 1.5 to 2% of good pollen was produced and the plants were self-sterile and failed to cross with either of the parents. It is hoped that fertile polyploids may be obtained which combine the desirable features of the two species, e.g. the resistance to bacterial leaf spot and high malic acid content (9%) of *N. alata* with the high yield and nicotine and citric acid content of *N. rustica*.

812. HEIERLE, E. 633.71:575(49.4)  
Der Tabakanbau in der Schweiz. Jahresbericht der Forschungsstelle der Einkaufsgenossenschaft für Inland-Tabak "SOTA", Zürich. (**Tobacco cultivation in Switzerland. Annual report of the Experiment Station of the Co-operative Buying Organization for Locally-grown Tobacco "SOTA", Zürich**).

Tabac, Rome 1939 : 2 : No. 3 : 20-40. Also in French pp. 41-57.

Work on tobacco improvement in Switzerland is proceeding along four main lines, (1) selection in local varieties, (2) variety trials of foreign tobaccos, (3) selection of hybrid progenies and (4) the cultivation of  $F_1$  hybrids.

Cured samples of a large number of foreign varieties were submitted to 14 manufacturers for the estimation of their quality and the results are shown diagrammatically. Some of these varieties were very promising in quality and yield and 100  $F_1$  hybrids between them and local types have been produced.

Data on cultivation, curing and other experiments are also given.

813. CHRISTOFF, M. 633.71:575(49.7)  
Sur l'amélioration de la production du tabac en Bulgarie. (**On the improvement of tobacco production in Bulgaria**).

Tabac, Rome 1939 : 2 : No. 1 : 38-40. Also in German pp. 40-42.

The organization of tobacco research in Bulgaria is described. There is one main experiment station, at Kosarsko, and four sub-stations situated in different regions of the country. These stations are concerned with breeding work, variety trials and research on curing, cultivation, etc. Fundamental studies of the theory and methods of selection are carried out by the Faculty of Agronomy.

The Kosarsko station has produced several selections which combine improved resistance to *Thrips tabaci* with relatively high yield. The Rila and Névrokope sub-stations are propagating selections of certain local varieties, and the sub-station at Djoumaya is working on similar lines.

814. SCHWEIZER, J. 633.71:575(92.2)  
Besoeikisch Proefstation (Proefstation voor rubber, koffie en tabak). Jaarverslag tabak over Juli 1938 t/m Juni 1939. [**Besoeiki Experiment Station (Experiment Station for rubber, coffee and tobacco). Annual report on tobacco from July 1938 to June 1939**].

Meded. Besoek. Proefst. 1939 : No. 64 : Pp. 64.

Owing to the reduced area planted under tobacco quantitative improvement in yield (including genetical work to increase the yield from Kedoe) has become highly important in the Netherlands East Indies.

In comparative trials of 5 Kedoe strains No. 322 and No. 103 were best as regards quality and burning property. No. 322 was also very good as regards length of leaf, though No. 303 ranked first in that respect.

Kedoe selection still aims at the discovery of a plant with more leaves than the ordinary Kedoe types; so far treatment with X-rays or colchicine has failed to produce a mutant of the desired type. In the meantime, as a compromise,  $F_1$  hybrids are being raised which resemble the Kedoe type of plant and yield from 25 to 30% more than the pure Kedoe, and two of them, Hybrids No. 443 and 444, have had favourable reports from experts in Holland. The production of  $F_1$  hybrids is to be continued each year, followed later by selection to obtain a constant line if possible. Kedoe  $F_1$  hybrids have also been produced with Havana varieties. Selection work with the various wrapper type hybrids was continued by comparative trials of the numerous lines at various centres. The expert grading in Holland agreed with local results in approval of Hybrid 362 in which the higher as well as the lower leaf was recommended. Plants from X-rayed seed showed no segregation or aberrant forms in  $F_1$  or  $F_2$ , probably owing to irradiation not having been sufficiently intense.

Seed treatment with colchicine to obtain giant forms has been ineffective.

Studies were also conducted on the relation between density of planting and quality, quantity and length of leaf.

Comparative trials of the resistance of Kedoe 103 and various hybrids to *Phytophthora parasitica* var. *nicotiana* gave no conclusive result owing to interference of environmental factors.

In tests of the hybrids Nos. 238, 343, 344, 362 and 238 x Canari for resistance to *Alternaria*, no differences in infection were found in Nos 343, 344 and 362 (= 343 x 344), but in two out of three tests Hybrid 238 and 238 x Canari were markedly infected. In Kedoe material some resistance to *Alternaria* was evident in lines 320 and 322.

In a heavily infected Kedoe plantation one mother plant practically free from infection was selected—namely “the greenish Kedoe”—and crosses of this plant have already been made with Kedoe 103.

Selection for resistance should, it is thought, play an important part in combating *Alternaria*. A breeding programme for 1939–40 appended to the report includes the following activities:—Special attention to testing Kedoe lines in various districts and to the study of new hybrids such as Kedoe 70 x K; L; E-2-8 and 340; breeding of new wrapper types, using Hybrid 344 and also crosses between Deli lines and Havana tobacco; selection in the special pre-harvest crosses between Virginia and home tobacco.

815. STINO, K. R. 633.71:575.11.061.6:576.356.2:581.46  
**Inheritance in *Nicotiana Tabacum*—XV. Carmine-white variegation.**  
 J. Hered. 1940 : 31 : 19–24.

An exceptional plant of *N. Tabacum* had variegated flowers which were carmine with white flecks. This condition was found to be due to the presence of a ring chromosome of variable size, of the type reported by McClintock in *Zea* (cf. “Plant Breeding Abstracts”, Vol. III, Abst. 407). The behaviour of this ring chromosome is described in some detail.

816. PERUCCI, E. 633.71:575.12:575.125  
 La production industrielle de la semence de tabac de première génération.  
**(The commercial production of  $F_1$  tobacco seed).**

Tabac, Rome 1939 : 2 : No. 3 : 71–75. Also in German pp. 76–79.

The author discusses the literature on heterosis in tobacco and reports the production of an  $F_1$  hybrid between Kentucky Perucci and Lecce Valle line 8, a tobacco of the Herzegovina type, which combined high yield with good quality, being suitable for cigarette manufacture. It was found that two plants yielded enough hybrid seed to plant three hectares.

The methods available for the commercial production of hybrid seed are described in some detail.

817. FATALIZADE, F. A. 633.71:575.127.2:576.354.4:576.16  
 633.71:575.129  
**Cytogenetic studies on the genus *Nicotiana* and the origin of *N. rustica*.**

C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : 25 : 770–72.

There is good evidence that *N. rustica* originated, at least in part, as an amphidiploid of *N. paniculata* x *N. undulata*. Crosses between *N. rustica* and either of these species have  $12_{II} + 12_I$ , whereas the  $F_1$  of *N. paniculata* x *N. undulata* and the haploid of *N. rustica* usually show no pairing. Further, the synthetic amphidiploid *N. paniculata* x *N. undulata* has been shown by Eghiz (unpublished) to resemble *N. rustica* var. *scabra* and to be readily intercrossed with *N. rustica* with the production of fertile offspring. *N. paniculata*, *N. undulata* and their supposed amphidiploid *N. rustica* var. *scabra* are all found growing in Bolivia and Peru.

The cross *N. rustica* x *N. solanifolia* also shows  $12_{II} + 12_I$  and it is possible that some of the forms of *N. rustica* arose from the amphidiploid *N. undulata* x *N. solanifolia*. The suggestion by Modilevski and Dsubenko (cf. “Plant Breeding Abstracts”, Vol. VIII, Abst. 900) on cytological grounds that *N. rustica* is an amphidiploid of *N. paniculata* x *N. glauca* is disproved by the fact that the triple hybrid with 24 chromosomes from *N. rustica*, 12 from *N. paniculata* and 12 from *N. glauca* is completely sterile and behaves highly irregularly at meiosis.

818. MARYANOVICH, O. 633.71:575.127.2:576.356  
**[On the cytology and embryology of the hybrid  $F_1$  *Nicotiana rustica* (variety Unterwalden) x *Nicotiana quadrivalvis*].**

J. Inst. Bot. Acad. Sci. Ukraine 1939 : Nos 21–22 (29–30) : 187–95.

In the  $F_1$  hybrid many univalents and a small and variable number of bivalents were observed

in the PMC. Anaphase separation and microspore formation were highly irregular and early degeneration of the microspores ensued. Divisions in the EMC showed similar irregularities but in one case a normal embryo sac was observed.

819. MODILEWSKI, J. and 633.71:575.127.2:576.356.5  
DZUBENKO, L. 633.71:575.129  
(**Cytogenetical investigation of the genus *Nicotiana*. VIII. Embryology and cytology of the amphidiploid *N. rustica* var. *pumila* x *N. paniculata*.**  
J. Inst. Bot. Acad. Sci. Ukraine 1940 : No. 23(31) : 3-12.

The  $F_1$  of *N. rustica* var. *pumila* x *N. paniculata* readily formed natural amphidiploids, while similar crosses of other varieties of *N. rustica* failed to do so. Studies of the  $F_1$  suggested that, contrary to the statements of Lammerts and Singleton (cf. "Plant Breeding Abstracts", Vol. I, Abst. 562 and Vol. III, Abst. 253), diploid gametes were not formed and that amphidiploidy was therefore not due to their fusion. Only occasional morphologically normal pollen grains were formed and these did not exceed the degenerated ones in size. The amphidiploid showed occasional formation of quadrivalents. Embryo-sac formation was rather irregular.

820. 633.71:575.127.2:581.6  
KOSTOFF, D. 633.71:576.356.5  
(**Nicotine and citric acid content in the progeny of the allopolyploid hybrid *N. rustica* L. x *N. glauca* Grah.**  
Tabac, Rome 1939 : 2 : No. 4 : 73-78.

This paper, here appearing in English, French and German has previously been published in English in Current Science and in the Comptes Rendus (Doklady) de l'Académie des Sciences de l'URSS (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 938).

821. TROTTER, A. 633.71:575.242:581.143.32  
(**Una interessante mutazione teratologica nel tabacco "Aja Soluk" affine al "Kroepoek" riscontrata nel Leccese. (An interesting teratological mutation, like "Kroepoek", in Aja Soluk tobacco).**  
Boll. Tec. Tab. 1939 : 36 : 193-202.

The abnormality described has very pronounced nerve development and often foliaceous outgrowths from the leaf midrib, and in many ways resembles leaf curl. It has only been observed in certain plants of the variety Soluk however and the characteristics have been perpetuated in the progeny and are therefore thought to be a genetic mutation.

822. BOYARSKY, Y. 633.71:575.247.061.6  
(**Bud mutations of the genus *Nicotiana*.**  
J. Inst. Bot. Acad. Sci. Ukraine 1939 : Nos 21-22 (29-30) : 217-19.

A chimerical plant was found in the  $F_2$  of the *N. rustica* cross Humilis (green) x Vergun (yellow). This plant had one green and one yellow branch, the flowers on each of which were bagged. Seed from the green branch gave only green plants and seed from the yellow branch only yellow plants. It is concluded that a somatic mutation was involved.

823. KAJITCH, M. 633.71:575.42(49.7)  
(**Développement et conditions oecologiques de la culture du tabac Yougoslave; mesures pour l'améliorer. (Development and ecological conditions of tobacco cultivation in Yugoslavia; measures for its improvement).**  
Tabac, Rome 1939 : 2 : No. 4 : 43-53; also in German pp. 54-62.

In this paper it is mentioned that two types of tobacco are grown in Yugoslavia, namely Jaka and Prilep. Both are cigarette tobaccos selected by the tobacco experiment station at Prilep and represent crosses between *Nicotiana Tabacum* and *N. Tabacum* var. *macrophylla*. The former was selected from a Greek variety Jaka and the latter from a type known as Djourmabala or Padenchko. Jaka is of higher quality than Prilep and is grown over a wider area.

824. MODILEWSKI, J. 633.71:576.356.5:576.3:581.3  
**(Cytogenetical investigation of the genus *Nicotiana*. VII. Crossing amphidiploid *Nicotiana disualovii* with some species of the genus *Nicotiana*).**

J. Inst. Bot. Acad. Sci. Ukraine 1939 : Nos 21-22(29-30) : 107-37.

Continuing the researches summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 811, the author reports the results of crossing amphidiploid *N. Bigelovii* x *N. suaveolens* (= *N. disualovii*) with *N. rustica*, *N. repanda*, *N. paniculata*, *N. glauca*, *N. longiflora*, *N. Langsdorffii* and *Nicandra physaloides*.

Successful crosses with several varieties of *N. rustica* were obtained, but only when *N. disualovii* was used as the male parent. The  $F_1$  exhibited marked heterosis and showed a greater similarity to *N. disualovii* than to *N. rustica*. It was sterile, meiotic chromosome pairing being absent.

Crosses with *N. glauca* were also successfully obtained, this time with *N. disualovii* as the female parent only. The  $F_1$  was again sterile, no bivalents being observed at diakinesis though chain-like groups of joined univalents were sometimes seen.

In the cross *N. disualovii* x *N. Langsdorffii* fertilization occurs and intensive early development of the ovules, embryos and endosperms ensues in spite of the great disparity in parental chromosome number ( $n = 40$  and  $n = 9$  respectively). This development is much more rapid than in the other crosses and in *N. disualovii* selfed. Later stages of development of this cross were not observed owing to lack of material. It is suggested, however, that the property of promoting vigorous embryonic growth may explain the fact that it is relatively easy to cross *N. Langsdorffii* with several other *Nicotiana* species.

The other crosses attempted were all unsuccessful. Studies of pollen tube growth, fertilization and embryonic development were made in order to determine at which stage the failure occurred in each case.

825. NOGUTI, Y.,  
 OKUMA, K. and  
 OKA, H. 633.71:576.356.5:581.04  
**Studies on the polyploidy in *Nicotiana* induced by the treatment with colchicine. I. General observations on the autotetraploid of *Nicotiana rustica* and *N. Tabacum*.**

Jap. J. Bot. 1939 : 10 : 309-19.

Plants of *N. rustica* and of two varieties of *N. Tabacum* with the doubled chromosome number were obtained by soaking the seed in colchicine solution. They showed the usual features of polyploids (thickened leaves, larger and fewer stomata, larger flowers, etc.), grew more slowly and flowered later than the "diploids". The nicotine content was increased by 51-62% in *N. Tabacum* and by 138% in *N. rustica*.

The polyploid plants showed 10 to 14 quadrivalents at meiosis and disjunction was often numerically irregular. The pollen was about 40% good and seed production was extremely low.

826. MODILEWSKI, J. 633.71:576.356.52  
**(Cytogenetic investigation of the genus *Nicotiana*. IX. Cytology and embryology of the haploid *N. rustica*).**

J. Inst. Bot. Acad. Sci. Ukraine 1939 : Nos 21-22(29-30) : 201-15.

A cytological and embryological study of the haploid *N. rustica* obtained by Bolsunov (cf. Abst. 827 below) is reported. Only univalents were formed but these appeared to be joined together in chains of three or four at early diakinesis, as previously described in *Triticum monococcum* by Kihara and Katayama (cf. "Plant Breeding Abstracts", Vol. IV, Abst. 957, also Vol. IX, Abst. 1031). In some embryo sac mother cells the univalents arranged themselves in a flat plate before passing to the poles. The embryo sacs degenerated early except in rare cases, which appear to have been due to the somatic division of the first nucleus of an embryo sac mother cell to form directly a binucleate embryo sac. Pollen mother cells did not normally develop beyond the tetrad stage. The plants yielded some seed when open-pollinated.

827. BOLSUNOV, I. 633.71:576.356.52:537.531  
**(An experimentally obtained haploid in *Nicotiana rustica* L.)**

J. Inst. Bot. Acad. Sci. Ukraine 1939 : Nos 21-22(29-30) : 197-99.

Homozygous plants of the variety Durman No. 5 of *N. rustica* were emasculated and pollinated with X-rayed pollen of the variety Mutant. The progeny contained a great variety of deformed,

defective or dwarf plants, most of which proved to be chromosome mutants; about one-third of the progeny were so affected. The dominant leaf characters of the pollen parent were evident in the offspring, except in four plants which were of the maternal type; two of these proved to be haploids. They were similar to the maternal plants in rate of growth and time of flowering; the final size of the plants and of all the organs was somewhat less than the diploids. The flowers were considerably smaller and were self-sterile. Attempts are to be made to effect chromosome duplication in the haploids and to examine the progeny.

828. BERNARDINI, L. 633.71:581.192.6:581.165.71:575

Tabac sans nicotine. (**Tobacco without nicotine**).

Tabac, Rome 1939 : 2 : No. 1 : 67-70. Also in German pp. 71-73.

The physical and bacteriological methods used for removing nicotine from tobacco are outlined, and the work done in America and at Forchheim on the selection of types low in nicotine is reviewed. It is pointed out that tobacco strains selected for low nicotine content will show plant-to-plant variation in the amount of nicotine and that continued selection will therefore be necessary to maintain the strain. A way of producing permanently nicotine-free strains is therefore desirable. The grafting experiments of H. Hasegawa are referred to; he found that when tobacco is grafted on to other solanaceous plants such as the tomato or egg plant the nicotine disappears from the scion and appears in the leaves of the stock. It is thought possible that by repeated grafting in this way it may be possible to produce tobacco seed completely devoid of nicotine which will give rise to strains permanently incapable of producing the alkaloid. Experiments along these lines are being conducted, and preliminary trials partially confirm the results of Hasegawa.

829. SAVELLI, R. and

CARUSO, C.

633.71:581.331.23:581.142

Stimulation mutuelle dans la germination des grains de pollen de *Nicotiana*. (**Mutual stimulation in the germination of the pollen grains of *Nicotiana***).

C.R. Acad. Sci. Paris 1940 : 210 : 184-86.

SAVELLI, R. and

CARUSO, C.

Action de masse et influence de collectivité dans la germination des grains de pollen de *Nicotiana*. (**Mass action and mutual influence in the germination of pollen grains of *Nicotiana***).

Tabac, Rome 1939 : 2 : No. 4 : 25-28. Also in German pp. 29-30.

Choosing the *Nicotiana Tabacum* varieties *macrophylla* and *fruticosa* of which the pollen can germinate in distilled water, the writers found evidence of a mass action or apparent mutual stimulation to germinate among the pollen grains. An explanation of the phenomenon has not yet been reached.

830. JOHNSON, J. and

633.71-2.484-1.521.6:575(77.5)

OGDEN, W. B.

633.71:582(77.5)

**Tobacco varieties and strains in Wisconsin.**

Bull. Wis. Agric. Exp. Sta. 1939 : No. 448 : Pp. 30.

The principles and technique of tobacco breeding are outlined in simple language. In Wisconsin two main types of tobacco are grown, the Havana Seed and Big Seed groups of varieties, the former of which produces the better quality leaf while the latter gives higher yields. These higher yields are often due merely to higher resistance to black root rot (*Thielaviopsis basicola*) and attempts have therefore been made by the Wisconsin State Agricultural Experiment Station to introduce root rot resistance into the Havana Seed variety. Some strains of this type, Havana Nos 142 and 211 have been grown extensively and further improvement along these lines is anticipated.

The varieties at present important in Wisconsin are described.

831. JOHNSON, J. and

OGDEN, W. B.

633.71-2.8-1.521.6:575(73)

**Tobacco mosaic and its control.**

Bull. Wis. Agric. Exp. Sta. 1939 : No. 445 : Pp. 22.

At the end of this bulletin on tobacco mosaic reference is made to the South American variety

Ambalema, which possesses considerable resistance to the disease. Attempts are being made to introduce this resistance into commercial varieties in the United States, but while some progress has been made it is too early to predict the final results.

832. 633.71-2.8-1.521.6:575.127.2  
633.71:581.192.6:575.127.2

KOSTOFF, D.

**Some cytogetic indices for applying interspecific hybridization in breeding desirable tobacco forms.**

Tabac, Rome 1939 : 2 : No. 4 : 31-42.

This paper (here published in English, French and German) has previously appeared in Rumanian and English and was summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 1564.

833. 633.72:575(47)

BAKHTADZE, K. E.

**(The technique of tea breeding).**

Soviet Subtropics 1940 : No. 1(65) : 13-21.

Selection has been performed among large numbers of seedlings from open pollination of chosen mother trees of the Indian-China type. Most of the seedlings were of the China type, and only 18-20% were of the desired commercial quality; this proportion was raised to almost 60% by controlled pollination with selected forms.

The proportion of good seedlings varied in different years. In the period 1933 to 1936 "first class" seedlings occurred in the proportion of 4-16%, "good" seedlings 1-12%, poor 60-80% and rejects 3-21%, which corresponds closely to the proportions reported in other countries. The quality of the seedlings varied also very largely in different families, some containing up to 53% good plants, others few or none. In consequence of this it was decided to select the mother plants on the basis of their progeny rather than their own qualities, though in the majority of cases the two were found to coincide.

The caffeine content of the selected plants varied from 2.05-3.44%, the protein content from 20.8-33.9%, the nitrogen from 3.3-5.4% and the tannin from 10.7-17.8%; glucoside content varied from 56-173 mg. *etc.*, invertase from 16-104 and amylase from 12-53. The Indian-China type exceeded the China type in content of the above constituents and in enzyme activity.

Up to 20,000 seedlings are examined each year. In 1932 the 20 best plants were artificially selfed but only 6 fruits were obtained. From these 53 seeds were obtained, only 10 of which germinated and the 5 inbred seedlings attaining the age of 1½ years all showed signs of depression and were of no interest for breeding. All the 15 control plants left for open pollination formed fruits and produced 116 seeds, from which 32 healthy normal plants were obtained. In view of the failure of inbreeding, experiments were made on sib crossing; various plants belonging to the same family were pollinated with a mixture of pollen collected from all the plants of the family. From 274 mother plants so treated 10,000 seedlings were obtained, all normally developed but mostly inferior to seedlings from open pollination. This method is also regarded as unsuitable for tea improvement.

Therefore 200 of the best seedlings were chosen as pollen parents and divided into 10 groups of 20 each, the pollen of all 20 plants in each group being mixed and used for pollinating the young plants of the collection garden. The progenies from 5,914 plants were studied in the period 1931-33 and subjected to mass selection. The progeny of selected mother trees so treated was similar to that from individual plant selections and contained about 20% of valuable forms, whereas the progeny of unselected plants contained only 0.5%, with 8.5% of good, 81% poor and 10% rejects, including about 1% of small leaved Japanese forms which occur very rarely indeed in the progeny of selected trees.

Plucking tests were carried out on 100 plants classed as good and another 100 classed as poor. The selected trees proved superior in vigour of development, and in size and quality of leaf. Thus during the growing season one selected plant produced an average of 1,790 buds and 974 grm. of leaf, whilst one unselected plant produced 1,465 buds and 672 grm. leaf, that is 45% less. The method of selection used has therefore been highly efficacious. Without selection there is a progressive deterioration in successive progenies, which tend more and more to approach the China type with reduced leaf size and quality.

By hybridization the proportion of high quality seedlings is raised from 15-20% (obtained by open pollination) to 60% and this is considered to be the most effective way of producing high-grade planting material. In view of the tendency of the tea plant not to self-pollinate the

hybridization can be done on an industrial scale without emasculation. The proportion of valuable seedlings in 1935 amounted to 33% in the hybrid progenies, 21% in sib crosses and zero in inbred progenies. The hybrid plants were also superior in size of leaf, amount of annual growth and number of growing points. The plants obtained by selection among progenies obtained by open pollination were still however in general better even than the hybrids, which is interpreted on the basis of selective fertilization. To overcome this defect in the hybrid plants the method of crossing with a mixture of pollen from the best plants has been adopted.

834. WELLENSIEK, S. J. 633.72:575.42  
De stand der theeselectie. (**The position of tea selection**).  
Bergcultures 1940 : 14 : 223-26.

After a short historical note the author treats the present position regarding methods and uses of vegetative propagation, of nursery selection and of clone testing; the laying down of plucking and seed gardens with buddings of selected material; the role of sexual reproduction (including hybridization) in tea improvement and the necessary preliminary biological study; quality studies and the micro-preparation method.

In the author's opinion future research will continue to use the method of sexual reproduction, while in the practical application of selection work vegetative reproduction will be widely used. Much of this paper has appeared in more elaborate form in articles already reviewed in "Plant Breeding Abstracts".

835. CHEVALIER, A. 633.73:582  
Nouveau groupement des espèces du genre *Coffea* et spécialement de celles de la section *Eucoffea*. (**New classification of the species of the genus *Coffea* and especially of those of the section *Eucoffea***).  
C.R. Acad. Sci. Paris 1940 : 210 : 357-61.

In addition to taxonomic considerations the author regards the section *Eucoffea* as of special interest as a source of usable coffee. The two subsections of *Erythrocoffea* and *Pachycoffea* are of importance, as from their beans substitutes for Arabica coffee which has to be imported could rapidly be provided for French consumption.

836. LAMBERS, M. Hille Ris 633.73-1.524(6)  
Indrukken van de koffiecultuur in Oost- en Midden-Afrika. (**Impressions of coffee cultivation in East and Central Africa**).  
Bergcultures 1939 : 13 : 1800-10.

A tour was made in the coffee regions in Tanganyika, Kenya, Uganda and the Belgian Congo to study coffee selection and cultivation and to collect herbarium material and seed of wild species to provide a collection of live plants for use in coffee improvement. At Kampala the author found his first wild Robusta and wild *Coffea eugenioides*. The research centres visited in the Belgian Congo included the Mulungu Tshibinda Station in Kivu, where good work is being done on Arabica selection, Nioka Experiment Station, and the I.N.E.A.C. Station at Yangambi.

The author mentions that Stoffels (of the Mulungu Station) has found that the great variation in the productivity of Arabica bushes is due to disturbance of the balance between productivity and growth and that this variability is greatest in the green tipped plants and least in the brown tipped plants. The latter are also less prone to over-production and die-back and black tip and in unshaded plantations brown tipped Arabica has done better than green tipped forms.

At Mulungu there were a number of Arabica lines which appear highly resistant to black tip and show a good average production. Selection on the basis of leaf bud colour can be effected at the seedling stage.

The types favoured at Nairobi Experiment Station and the attitude at various research centres in Lyamungu, Amani and Nairobi to the question of vegetative as compared with sexual reproduction are recorded. Near Kampala (Uganda) successful selection for a desirable type of bending stem was noted; the origin of the selected trees with this habit was a tree composed of four stems which showed a marked tendency to bend outwards, this habit being also exhibited by the successive new stems formed. Bushes of this kind were of the Uganda or Robusta types.

At Yangambi the *Canephora* and Quillou types were found and also forms known there as *C. canephora* var. *Quillouensis* which combine the growth habit of Quillou with (in their early stage) the bronze berry colour found in *Canephora* trees. These seedlings were derived from plants found growing wild. At this centre too investigations are in progress on artificial crossing and self-pollination including observations on self-fertility in Robusta. In the Arabica plantations material from all possible coffee producing countries is assembled for the ultimate selection of lines suitable for various regions in the Belgian Congo. Extensive testing of the various wild forms like Robusta is going on; less attention is paid to *Congensis* or forms like Excelsa. No tests have yet been made to determine how far self-pollination is successful in the wild "Robusta" mother trees; the seedlings from them are often remarkably uniform. *C. eugenioides* was also found wild in Kenya, Uganda, Kivu and further north in the Belgian Congo. It exhibits a remarkable variability. In a plantation of this species plants have been found so closely resembling *C. arabica* as to lead to the wrong identification of samples sent to Europe. The possible relation between *C. arabica* and *C. eugenioides* presents an interesting problem. The writer also found two very different forms of *C. congensis*, one of which closely resembled certain *C. eugenioides* forms and 16 mother trees of the latter species clearly resembled *C. congensis* in berry, tree and leaf form. From his observations on his tour, he believes that *C. arabica* and *C. congensis* may possibly have arisen from some one ancestral form by hybridization. Wild Robusta and *C. eugenioides* material has been collected for a study of hybridization. Discussing Chevalier's view of the status of *C. canephora* as a single main species, the author recommends the systematic sowing and study of wild seedlings as the only way of solving the problem of the relations between the various *Coffea* species.

Describing the methods used in searching for wild types of coffee, observations are recorded on seed distribution and germination in the case of solitary wild trees. Young plants were found under isolated specimens of *C. eugenioides* and under *C. brevipes*, a variety with large berries which has not yet been introduced into Java.

The value of the author's collection is to be tested in Java by crossing and selection.

The disease resistance of "Nandi" coffee (*C. eugenioides*), seedlings and grafts on Quillou and on Arabica stocks and also the role of the Congo as a coffee producing country were touched upon in the discussion following the lecture.

837. HEEGER, E. F. 633.75:575:581.6

Sortenkundliche Untersuchungen zur Frage der Opiumgewinnung in Deutschland. (**Varietal investigations on the question of opium production in Germany**).

Forschungsdienst 1939 : 8 : 508-14.

In this account of the present situation in Germany as regards the development of poppy varieties as a source of opium observations are recorded on the morphine content of different varieties grown in the country. A micro-technique had to be adapted to determine the small amounts of morphine present.

The varieties for testing were classed in 3 groups according to seed colour—white, black and miscellaneous; but considerable variation was noted since the poppy is mainly cross-pollinated. Morphine content is regarded as a heritable character and various correlations were found between it and seed colour and between it and shape of capsule.

The blue seeded varieties of poppy had a higher morphine content than the white seeded ones. Varieties with white and white to ivory coloured seeds gave in general the highest amount of opium, but had the lowest morphine content.

The capsule shape also showed correlations with morphine content, the spherical type having the highest content and the elongated type the lowest.

838. HARLAN, J. D. 633.79:575(42)

N.Y. State's experiments in growing new varieties of hops. 633.79.00.14(73)

Amer. Brewer 1939 : 72(8) : 27-29.

Trials were made of seven hop varieties, most of which were developed by Salmon in England. Data are given on the parentage of the varieties studied, the conditions under which they were grown, their yields, seed content and resin content. The best results were reported from Brewer's Gold, Late Cluster and Millstate.

839. HOLUBINSKY, I. N. and HOLUBINSKAJA, N. I. 633.79:575.243:576.356:581.036.1  
**Effect of heat upon the mutation rate in hop (*Humulus Lupulus* L.).**  
 C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : 25 : 773-76.

Treatment of hop seed from open-pollinated mother plants for periods of 12 hours to 20 days at 60° C. at normal atmospheric humidity or for one hour at 60° C. in a saturated atmosphere led to the production of plants with markedly abnormal growth. Many perished in the seedling stage but others matured and continued to show abnormalities. Irregularities in chromosome behaviour were observed, chiefly lagging chromosomes, irregular disjunction, extrusions into the cytoplasm and the occurrence of polyploid and haploid cells. One plant resulting from the treatment appears to be a tetraploid.

Treatment for periods longer than the above led to death of the seeds.

840. HOLUBINSKY, I. N. 633.79:577.8:575.11  
**Numerical relations of sexes in various hybrid combinations in hop.**  
 C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : 25 : 414-18.

Progenies of hop crosses show considerably less than 50% of male plants. The exact proportion of males is shown to vary according to the particular combination of parents used. The deficiency of males is apparently not due to the parthenogenetic formation of a fraction of the seeds or to differential seedling viability.

### AROMATIC PLANTS 633.8

841. BREGMAN, A. 633.84:575.42(92)  
 De pepercultuur en -handel op Bangka. [**Cultivation and trade of pepper (*Piper nigrum*) in Bangka Island**].  
 Landbouw 1940 : 16 : 139-256.

This monograph, which deals comprehensively with its subject, contains a description of the Lampong, Muntok (or Bangka) and Merapin types of pepper with a short section on varieties and the problem of selection.

The biology of flowering is also discussed.

Selection work presents many difficulties, but small plots of the Bangka and Muntok types of plants have been laid out by the Dutch Agricultural Advisory Service and the plants are to be studied individually for characters of economic value—especially yield and disease resistance. Cuttings from selected plants will then be tested in hopes of ultimately obtaining superior clones.

No hybridization work has yet been done with pepper in Bangka, though its possibilities are just briefly mentioned.

### OIL PLANTS 633.85

842. POPOVA, G. M. 633.85:575(47)  
**(Breeding oil crops).**  
 Seleksija i Semenovodstvo (Breeding and Seed Growing) 1939 : No. 12 : 5-7.

A brief general outline is given of Soviet breeding work with oil seeds, with indications of the forms most promising for breeding for a number of specific requirements. Improved forms of most of the oil crops grown have been produced and are enumerated.

843. HONIG, F. 633.853.49-1.557:581.162.32  
 Höhere Rapsrerträge durch Fremdbestäubung. (**Higher yields of rape by cross-pollination**).  
 Mitt. Landw. 1940 : 55 : p. 81.

Experiments are cited showing that a 20% increase in yield of seed is obtained by cross-pollination as compared with self-pollination. Moreover the seeds set after crossing are 5% larger and should therefore produce more oil.

Rape is not anemophilous and bee-keeping is recommended as the best way of ensuring cross-pollination.

844. VAKULIN, D. J. 633.854:575.114  
**A new narrow-leaved large-seeded form of *Lallemantia iberica*.**  
 C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : 25 : 781-83.

The new type, which was found in a stock of pink-flowered *L. iberica*, has larger seeds than

normal, longer and narrower leaves and matures two days later. It is named *L. iberica* var. *angustifolia* D. Vakulin.

845.

MINKEVIČ, I. A.

633.854.54:575:581.6(47)

633.854.54:575:633.52

(**The Soviet collection of linseed and its importance for breeding work**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1940 : No. 1 : 25-26.

Selections from local varieties have proved superior to the best commercial varieties in yield, oil content and resistance to drought and fungous diseases. The variety Safedak contains 45.26% oil in the absolutely dry seeds, the oil being also of high quality, having an iodine number of 188.65, which is higher than oil of *Lallemantia* (187.24); the yield of oil per hectare was greater than that from the standard varieties of linseed and exceeded that of *Lallemantia* by 5 times.

A dual-purpose variety No. 5237 has yielded 16.3 centners of seeds per hectare (compared with 16.1 for the standard variety) and at the same time produced 12.3% by weight of fibre from the stems, which compares well with the best standard textile variety, producing 12%.

846.

VYDRIN, V. I.

633.854.78:575(47)

(**New promising varieties of sunflower for Siberia**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : Nos 10-11 : 27-29.

Early maturity, upright habit, yield, oil content, presence of protective sheath against attack by *Orobanche* and uniformity of growth, flowering and maturity are some of the points in which the new varieties are superior to the earlier selection "Pioneer of Siberia."

#### RUBBER PLANTS 633.91

847.

FERRAND, M.

633.912:575.42:581.143.7

Note sur la sélection de l'*Hevea* en pépinière. (**Note on selection of *Hevea* in the nursery**).

Rapport Annuel pour l'Exercice 1938 (2<sup>me</sup> Partie) Publ. Inst. Agron. Congo Belge 1939 : Hors Sér. : 99-113.

At the present stage of our knowledge of the problem of nursery selection the author feels justified in recommending the use of the Testatex method (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1342) in testing nursery progenies after the weak plants have been discarded. In addition to the Testatex tests determinations of latex concentration, in individuals of the superior groups might also be made and the relation (if any) between the rate and vigour of the development of the radicle during germination on the one hand and the vigour of the plants might be investigated.

In his own experiments the writer found that in some plants the latex concentration is more constant than in others. Latex concentration should be determined during the dry season—a procedure which would incidentally ensure the selection of plants less susceptible to the effects of drought.

848.

COLENBRANDER, G. H.

633.912:581.481:578.08

Het splitsen van *Hevea*-kiemplanten. (**The splitting of *Hevea* seedlings**).

Bergcultures 1940 : 14 : 84-85.

ANONYMOUS.

Eenige aanvullende gegevens van het Proefstation Midden- en Oost-Java betreffende het hiervoor behandelde onderwerp. (**Some supplementary data from the Central and East Java Experiment Station regarding the preceding topic treated**).

Bergcultures 1940 : 14 : 86-87.

The first paper is a record of successful results on the Ngrangkah Pawon Estate where the total yield of living plants from the splitting of 16,486 seedlings was 29,317 or 178%.

With the technique used the seedling is divided when the radicle is not longer than 2 to 3 cm. and still lies bent between the stalks of the cotyledons. Important points in ensuring success are held to be (1) the connexion between the half seedling and the cotyledon must not be severed in dividing the plant; (2) shade must be provided for the young plants, especially immediately after transplanting from their wicker pots to nursery beds.

The second paper by the Director of the Central and East Java Experiment Station contains some additional recommendations on the necessary precautions in the technique and its use.

849. BANGHAM, W. N. and  
ANGREMOND, A. d'. 633.912-1.557:581.162.32  
Tapresultaten van eenige nieuwe A.V.R.O.S.—*Hevea*-cloonen, welke door  
kunstmatige kruisbestuiving ontstaan zijn. (**Tapping results on some  
new A.V.R.O.S. *Hevea* clones which originated in cross-pollina-  
tions**).

Arch. Rubbercult. Ned.-Ind. 1939 : 23 : 191-231.

Clones numbering 1,805 have been derived from seedlings obtained either by artificial pollina-  
tions at the A.V.R.O.S. Experiment Station or from open-pollinated families obtained from  
seedlings from earlier crosses and large numbers of these clones have been tested on Dolok  
Merangir Estate. The relevant tables reveal very high yields at an early age from some of  
the clones and in two out of three tests the mean yield of all the clones tapped was above  
that of BD 5 control, the latter being a clone on the approved list in Java.

Fifteen clones which have each given at least double the mean yield for all the clones in the  
test during three test periods and in most cases more than twice the mean yield for the control  
plots (BD 5) for the same periods are expected as a group to exceed the mean of the population  
in yield. Probably some will continue to prove superior to BD 5 in commercial plantings.

The records show that families obtained by uncontrolled pollination between certain parents  
did not give clonal families with such a high yield or such high yielding individuals as families  
from controlled pollinations which had the same clone as one parent. Furthermore, it appears  
that the highest yielding clone families—both from controlled and from uncontrolled pollina-  
tions—are those which have been successful in previous test tappings.

The practical applications of these results for planting on estates are indicated.

In describing the performance of individual clones notes on the size of crown and on resistance  
to wind damage are included.

## FRUIT TREES 634

850. STEPANOV, P. A. 634:575.127  
(**The efficacy of Michurin's principles**).  
Sadovodstvo (Horticulture) 1939 : No. 12 : 22-23.

Reference is made to a number of workers who have applied Michurin's methods with success  
and to new varieties of fruit trees they have produced.

851. KOVALEV, N. V. 634-1.524:581.5  
(**Principal regularities in ecological differentiation of fruit trees**).  
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1940 : No. 1 : 5-9.

The ecological characteristics of the main centres of diversity of fruit trees are described and  
the ecological type of the forms found there is shown to correspond. Some groups are more  
disease-resistant than others and the organisms which certain groups tend to resist are  
indicated.

In crosses between distinct ecological types earliness and rapid growth are usually dominant,  
as also are short dormancy period, cold resistance of the flowers in the early stages, superficial  
root system and immunity to certain diseases, such as scab and leaf spot, associated with the  
eastern tropical species of *Pyrus* and *Malus*.

852. OSMANOV, V. O. and 634.11:575(47)  
SOSNIN, S. V. 634.13:575(47)  
(**New élites of apple and pear from the Crimean Fruit Station**).  
Sadovodstvo (Horticulture) 1939 : No. 12 : 27-30.

Fifteen thousand apple and pear seedlings are under observation and six of each have been  
selected as élites and are here described, with indications of their parentage.

853. MAIER, J. 634.11:575(74.7)  
(**Developing new varieties of apples**).

Proc. 85th Annu. Mtg N.Y. St. Hort. Soc. 1940 : 148-51.

The apple breeding work at the New York Agricultural Experiment Station at Geneva, N.Y.,  
is briefly reviewed. Nearly 16,000 seedlings have so far been produced from 110 parent  
varieties and many of the earlier ones are now in the final stages of testing. The Cortland variety

is, however, the only one commercially established on an extensive scale as yet. The objectives in breeding are winter-hardiness, resistance to disease and spray injury, late flowering to escape spring frosts and, of course, improved yield and quality.

854. NEAR, R.

634.11:575(74.7)

**Our apple varieties.**

Proc. 85th Annu. Mtg N.Y. St. Hort. Soc. 1940 : 273-75.

The position of the major present-day apple varieties of New York State is outlined. One of the chief requirements is a high yielding, high quality, late keeping variety suited to table use or cooking. The McIntosh flavour is regarded as the standard and apples of this type maturing at different times throughout the season are required, in addition to the late type. Crosses to achieve these ends have been made at the New York Agricultural Experiment Station and several promising new varieties have been produced. Early McIntosh, derived from the cross McIntosh x Yellow Transparent, and Milton, of similar parentage, are early varieties that appear to be superior to the older varieties maturing at the same time, and they are being widely planted. Cortland is a later type derived from McIntosh x Ben Davis and is continually gaining in importance. Macoun, a selection from the cross McIntosh x Jersey Black is of pleasing quality, though sometimes too dark in colour. Kendall, from the cross Zsuffi Winter x McIntosh, is the newest production in this series and has not yet been properly evaluated.

The Delicious apple has also been used as a parent and Sweet Delicious, derived from the cross Delicious x Deacon Jones, is the best winter sweet apple now available. Orleans and Median are also new varieties of Delicious parentage.

855. GRÜNER, M. N.

634.11:581.165.712:581.143.26

**(On the development of the apple seedling).**

Proc. Lenin Acad. Sci. U.S.S.R. 1939 : Nos 23-24 : 6-12.

The experiments showed that scions taken from the upper part of the crown of a six-year-old seedling came into bearing earlier than those from lower down the tree and breeders are advised to take scions from the upper portion when multiplying young seedlings vegetatively.

856.

634.11-2.111-1.521.6:575(47)

MANSVETOV, V. I.

634.11:575.127.5:634.13

**(In the path of Michurin).**

Sadovodstvo (Horticulture) 1939 : No. 12 : 24-25.

Descriptions are given of a number of varieties of apple and pear produced by Professor S. F. Černenko by crossing hardy local forms with dessert varieties such as Landsberg Reinette. Seedlings have been obtained by pollinating pears with a mixture of pollen from a number of different apple varieties.

857. KOVALEV, N. V.

634.22:575.127.2

**(New varieties of myrobalan).**

Sadovodstvo (Horticulture) 1939 : No. 12 : 44-45.

A number of ecotypes and cultivated types of *Prunus cerasifera* are described, with indications of their value for breeding. Natural hybrids with apricot and *P. spinosa* have been found and many of them give satisfactory yields of fruit of quite good quality. The myrobalan will also cross with all North American and Eastern Asiatic plum species.

858. ROŽKOV, M. I.

634.22:581.6:575(47)

**(An excellent plum variety).**

Sadovodstvo (Horticulture) 1939 : No. 12 : 37-38.

The new variety Arton is of excellent quality for preparing prunes. It is highly frost-resistant, and exceeds the standard variety "Italian Prune" in sugar content and disease resistance.

859. LESLEY, J. W.

634.25:581.143.26.036.5:575(79.4)

**Five new peach varieties especially adapted to mild winters.**

Bull. Calif. Agric. Exp. Sta. 1939 : No. 632 : Pp. 19.

In regions adapted to the growth of sub-tropical fruit trees the peach often exhibits prolonged dormancy and the flower buds may drop and the crop consequently fail. This is due to the fact that most varieties require a period of chilling (e.g. two months at 32° to 48° F.) in order to break the winter dormancy. Varieties of the South China or Honey and Peento groups require relatively little chilling but are seriously defective in other respects. Efforts have

therefore been made to produce desirable types by crossing members of these groups with commercial varieties. Early seedlings obtained in the course of these experiments (including the Babcock variety which was released in 1933) have also been further crossed with commercial types. There is evidence that "chilling requirement" is a character determined by multiple genes, the  $F_1$  hybrids tending to be intermediate but distinctly more like the parent that requires less chilling.

The five new varieties released for small scale trial are Rosy (a mid-season, white-fleshed freestone), Golden State (a yellow-fleshed freestone of large size and good quality), Ramona (a yellow-fleshed clingstone suitable for canning), Hermosa (a white-fleshed freestone closely resembling Babcock but ripening in mid-season) and Sunglow (a mid-season freestone of good appearance, orange-yellow flesh and agreeable flavour as a fresh fruit).

860. 634.25-1.521.5:575.11  
634.25:575(74.9)

**Fruit breeding an aid to truth.**

N.J. Hort. Soc. News 1940 : 21 : p. 1182.

It is pointed out that a knowledge of peach genetics makes it possible to expose many fraudulent claims by nurserymen who may introduce an old variety under a new name and claim that it is a new hybrid between two stipulated parents.

At the New Jersey Agricultural Experiment Station more than 100 different crosses between peach varieties have been made and their progeny are being studied.

**CITRUS FRUITS 634.3**

861. WEBBER, H. J. 634.31:576.16  
**When did the sweet orange reach Europe ?**  
Calif. Citrogr. 1938 : 23 : 451, 480.

The conclusion is reached that the sweet orange reached Europe by the same route as the citron, sour orange and lemon and that though this introduction was accomplished before the discovery of India, the Portuguese played an important part in the dissemination of the orange.

862. MENDIOLA, N. B. 634.39:575.127.2(91.4)  
**Introduction of tsampedak and suspected case of natural hybridization in *Artocarpus*.**  
Philipp. Agric. 1940 : 28 : 789-96.

Evidence is presented that the tsampedak (*A. Champeden* Spreng.) readily hybridizes with the jackfruit (*A. integrum* Merr.) under Philippine conditions. This is held to account for the fact that planting of the tsampedak has not been extended greatly in the archipelago, since trees grown from seed have not reproduced the parent type and have been disappointing. The development of some method of vegetative propagation or, failing that, the establishment of isolated seed gardens, seems to be necessary.

**NUTS 634.5**

863. GREEVES-CARPENTER, C. F. 634.53-2.421.9-1.521.6:575(73)  
**A blight-resistant chestnut.**  
Sci. Amer. 1939 : 161 : p. 93.

The Chinese chestnut *Castanea mollissima* has been crossed with the American chestnut and one of the hybrids, while producing nuts equal in size, quality and sweetness to the American form, has remained free from blight for 20 years. Over a thousand one year old seedlings have been distributed.

864. TROS'KO, I. K. 634.574:577.8:581.4  
**[How to distinguish female pistachio plants from male (in the winter period)].**  
Soviet Subtropics 1940 : No. 3(67) : p. 58.

Certain morphological differences in the flower buds, giving the male buds a more rounded and the female a more sharply conical outline, permit of the distinction of male and female individuals out of the flowering season.

BOLHUIS, G. G.

B. De selectie van aardnoten, kedelee en cassave. (B. Selection of groundnuts, soya bean and cassava).

Verslag van de 26ste vergadering der Vereeniging van Proefstationpersoneel October 1938. [Overdruk] Pp. 9.

The chief aims at Buitenzorg in groundnut selection are enumerated, namely high yield and resistance to slime disease, erect foliage, large seeds, pods with more than two seeds and only slight or no constriction, and finally, early ripening. The results obtained in the Netherlands East Indies by selection and breeding methods are recorded:—

Varietal selection adopted for indigenous and for imported races has not yet given results of practical value, varieties of suitable habit all seem to be very susceptible to slime disease. In addition to the forms of *Arachis hypogaea* grown locally, other forms of the *A. rasteiro* Chev. and *A. nambiquarae* Hoehn types have been imported and, though possessing the defects of a creeping habit, very low yield and a very long growth period, they have good large pods and are highly resistant to slime disease. Their chromosome number is the same as that of *A. hypogaea* ( $n = 20$ ).

Line selection among various native varieties for resistance to slime disease has been successful and the highly resistant line Schwarz 21 which had the best yield of the original 52 lines under test has been retained.

Imported plant material (ranging from moderately to very susceptible) has been used in crosses in which, however, the resistant Schwarz 21 has been used as the ♀ parent. Hybridization effected artificially gave a set of 34 and 42% in contrast to natural cross-pollination between plants grown in alternating rows, which gave only 0.7 and 2.1%. From hybrid populations obtained by artificial pollination some new varieties have been found which surpass the standard variety Schwarz 21 in yield; but further plot tests must decide whether the new forms should be recommended to growers.

Since slime disease is practically the only serious disease affecting groundnuts and since further increases in yielding capacity seem unlikely, future breeding will probably be concentrated on selection for large seeds and early maturity from hybrid material. Early varieties or forms will have to be imported from abroad.

Among the aims towards which soya bean breeding is directed in the Netherlands East Indies are white or black testa, yield, late or early ripening, high grain weight, uniformity in ripening, non-dehiscent pods at maturity, high content of protein and fat.

Selection of indigenous varieties produced no good results though indirectly some of the material thus obtained has been very successfully used in hybrid selection.

From imported varieties or populations (e.g. the "otan" and "botan" populations from Japan) some very successful lines have been isolated and have replaced some of the indigenous varieties of the Netherlands East Indies.

Extensive breeding by hybridization has resulted in 25 hybrid populations being produced, all except three having originated from natural crosses. Further crossing has been undertaken to obtain large seeded varieties. Species crossing is not regarded as a suitable method—a conclusion confirmed by the inferior  $F_2$  and  $F_3$  obtained in Japan from crosses between *Glycine ussuriensis* and *G. hispida*, both of which have 20 chromosomes as the haploid number. One of the difficulties in soya bean breeding at Buitenzorg is the unfavourable climate and attempts are being made to eliminate this factor as far as possible by following the native methods of cultivation. The so-called early varieties are not specially suited for sowing after "sawah" rice.

In future considerable attention will be given to breeding late varieties. As regards the early ones high yield and increased 1,000-seed weight will be important points in breeding.

Extensive selection of cassava has been in progress since 1937 when a large collection of native varieties from marl ground and other similar soils was made for the Ngale breeding plot in Madioen. The main aims in breeding are for all varieties—high yield and percentage of starch in the root, a low percentage of rind and resistance to diseases and pests; for varieties for consumption—in addition to the above desiderata—a hydrocyanic acid content as low and a protein content as high as possible, relatively high productivity when the plant is still young (so-called early maturity) and a good flavour; for varieties intended for flour production—

as well as the first four requirements mentioned above, also high viscosity of the flour, high toxicity (to prevent theft) and as low a protein content as possible.

As a method of improvement the testing of native varieties has not been very successful; but some of the imported varieties from Brazil have given very good results.

For the last six years all crosses have been artificially made. Many varieties flower earlier and more luxuriantly at about 1,000 metres above sea level. Results from artificial crosses have so far been few, but hybrids Nos 423, 424, 433, 434 and 435 are being tested. The variety Bogor, which is regarded as promising, is thought to have arisen by natural crossing of the imported varieties Mangi and Sao Pedro Preto. Crosses have also been made between *Manihot utilissima* and *Manihot Glaziovii* and variety I 7 obtained from open pollinated seed from the hybrids is now being tested. The seedlings from these crosses are particularly vigorous in growth. The same cross has been repeated with a better type of cassava parent than in the previous cross.

In 1937 other crosses were made between seedlings from a species of *Manihot* not yet identified from Dutch Guiana and the cassava variety Basiorao; the progeny are now being selfed. The Dutch Guiana form which is not itself usable contains in its very small roots about 11% protein (calculated on the basis of dry matter) whilst ordinary cassava contains about 1.5%. Crosses of cassava with *M. dichotoma* and *Ricinus communis* have given no result so far. Colchicine experiments to obtain polyploid forms have been begun.

### PALMACEOUS AND OTHER TREE FRUITS 634.6

866. BONDAR, G. 634.6(81)

Palmeiras da Bahia. (**The palms of Bahia**).

Bol. Inst. Cent. Fom. Econ. Bahia 1939 : No. 6 : Pp. 22.

The bulletin includes a description of a new species *Cocos campos-portoana* Bondar, whose kernels are used for oil extraction and for roasting. Selection is being started to improve the kernel size and reduce the thickness of the endocarp.

Other oil producing species are *C. botryophora* Mart. and *Diplothemium caudescens* Mart. The flesh of this latter species is also used; *D. maritimum* has leaves which can be used for fibre (raffia) and for wax production and *D. campestre* produces nuts the size of hazels and of a similar flavour.

Descriptions of the species are given.

867. 634.653(79.4)

BARRETT, C.

**Report of the Variety Committee—1939.**

Yearb. Calif. Avocado Ass. 1939 : 24–29.

Avocado variety trials, each involving the same 14 varieties, have been set up in ten different places in southern California.

Fuerte is still the dominant variety but does not do well in certain districts; some growers in such districts are therefore trying to establish strains suited to local conditions and some such strains are already widely known but have not been fully tested.

The major varieties now in commercial production are briefly described and also a number of new “experimental varieties” which are not yet fully tested.

868. COIT, J. E. 634.653:575(79.4)

**Germplasms of the Mexican avocado.**

Yearb. Calif. Avocado Ass. 1939 : p. 47.

The various early importations of the Mexican avocado into California are reported; they have led through intercrossing to a very large variety of present-day strains and continued intercrossing and selection should yield marketable varieties resistant to both cold and heat.

869. 634.653:575.242

**An interesting new Fuerte sport.**

Yearb. Calif. Avocado Ass. 1939 : p. 115.

A new mutant of the Fuerte variety of avocado is illustrated and briefly described. It has black fruits with thick, rough “alligator hide” skin. It is not considered to be of commercial value.

## SMALL BUSH FRUITS 634.7

870. MATVEEVA, E. 634.711:575(47)  
**(New varieties of raspberry for the northern zone).**  
 Sadovodstvo (Horticulture) 1939 : No. 12 : 39-40.

Descriptions are given of a number of varieties produced at Krasnyi Pakhar, near Leningrad, and distinguished by improved quality and yield.

871. KONDRAT'EVA, M. N. 634.725-2-1.521.6(47)  
**(New varieties of gooseberry).**  
 Sadovodstvo (Horticulture) 1939 : No. 12 : p. 42.

New varieties resistant to *Sphaerotheca*, rust and frost are described.

872. TEMPLE, C. E. 634.75-2.411.4-1.521.6:575(75.2)  
**Red stele root rot of strawberry.**  
 Trans. Peninsula Hort. Soc. 1939 : 29 : No. 5 : 141-49.

The reactions of a large number of strawberry varieties to red stele disease caused by *Phytophthora* sp. are tabulated. An extensive breeding scheme to produce resistant varieties is under way at Beltsville, Maryland, and many seedlings are now being tested. It is noted that in crosses between the resistant variety Aberdeen and the susceptible varieties Dorsett and Fairfax, approximately 50% of the  $F_1$  hybrids showed no trace of the disease.

## VITICULTURE 634.8

873. NOACHOVITCH, G. 634.835:575.11  
 Génétique et viticulture. **(Genetics and viticulture).**  
 Rev. Vitic., Paris 1938 : 88 : 287-89.

Reference is made to the *Vitis vinifera* hybrids of Bouschet, characterized by high yield and production of wine both rich in alcohol and of good colour; and to the production, by interspecific crossing, of resistant hybrids capable of being used as rootstocks or as direct producers. The influence of modern genetical knowledge upon the technique of practical breeding is touched upon, an illustration being the size of the populations that are now used in hybridization work.

874. SOUSA, L. de Oliveira Mendes da Costa e 634.835:582(46.9)  
 Contribuição para a taxonomia da *Vitis vinifera* L. Estudo botânico  
 alguns clones nacionais de videira. **(Contribution to the taxonomy of  
*V. vinifera* L. Botanical study of certain national vine clones).**  
 An. Inst. Sup. Agron. Lisboa 1938 : 9 : 327-424.

The problem of synonyms in vines is in a state of extreme confusion and a thorough study is being made of the large vine collections of the Instituto Superior de Agronomia, characters of the vine, bud, leaf, stipules, tendrils, flowers, bunch, fruit and seed being examined. Full descriptions are given of certain important varieties, together with illustrations and tabular data. The characters of the leaves, bunch and shoots were found to be the most important. The period of germination of the seeds was also a useful distinguishing feature for certain varieties.

The second part consists of similar observations on the anatomical and histological structure of the varieties.

On the basis of these observations it is concluded that the varieties of *V. vinifera* are extremely heterozygous and features characteristic of other species such as *V. rupestris*, *V. cordifolia* and *V. Linsecomii* were frequently observed. The characters of these species themselves are subject to certain variation, in consequence evidently of their being heterozygous to some extent too; the appearance therefore of a feature characteristic of a particular species does not necessarily indicate the participation of this species in the origin of the variety concerned. Variation occurs not only within the variety but within individual plants, which not infrequently display one character in one section and another in a different section, and these differences are sometimes more pronounced than differences between varieties. On the other hand clear anatomical differences have sometimes been revealed between two forms whose external morphology was apparently identical.

875. NAVARRO, A. F. and VASCONCELLOS, J. de Carvalho e 634.835:582:575.12  
Características ampelográficas e ampelotaxonómicas no género "*Vitis*", L.  
(**Ampelographic and taxonomic characteristics in the genus *Vitis* L.**).  
An. Inst. Sup. Agron. Lisboa 1938 : 9 : 77-99.

The work has already been reviewed in "Plant Breeding Abstracts", Vol. IX, Abst. 1211.

876. ORAMAN, N. 634.835-1.524:582(56)  
Ankara Vilâyeti Bağcılığı ve Ankara da yetişen baslica üzüm çeşitlerinin  
Ampeloğrafisi. (**Viticulture of the Ankara Province and the ampelo-  
graphy of the most important varieties grown in the Province**).  
T. C. Yüksek Ziraat Enstitüsü Çalışmalarından, Ankara 1937 : No. 61 :  
Pp. 170. Also in German. Pp. 206.

A monograph based on investigations on viticultural conditions and methods in the Ankara region and on the varieties found there, thirty-five of which are described in detail. A key to varieties of the district is also provided and diagrams of berry and leaf types are included among other illustrations.

Drought resistance, which is regarded as the most important adaptation produced by natural selection in the Central Anatolian region, is discussed.

877. NEGRUL, A. M. and KONDO, J. N. 634.835-2.111-1.521.6:575.127.2  
(**Heredity of cold resistance in buds of hybrid grapes**).  
Proc. Lenin Acad. Sci. U.S.S.R. 1939 : Nos 23-24 : 13-17.

Artificial cooling tests of a number of forms of *Vitis* showed *V. amurensis* Rupr. to be the most hardy species, followed by *V. rupestris*. Riesling was the hardiest of the European *V. vinifera* varieties.

Hybrids of *V. vinifera* x *V. amurensis* were intermediate but hybrids within *V. vinifera* sometimes surpassed the more resistant parents, some of the best hybrids of prol. *orientalis* Negr. x prol. *pontica* Negr. being almost equal to the hybrid Nimrang x *V. amurensis* in hardiness. The full data on the crosses are tabulated.

Inbred seedlings were somewhat inferior to the parents in hardiness.

#### FORESTRY 634.9

878. NILSSON-EHLE, N. and SYLVÉN, N. 634.97:575(48.5)  
Växtförädling hos skogsträden. (**Forest tree breeding**).  
Svensk PappTidn. 1938 : No. 1 : Pp. 3.

An account (written in 1937) of the intended organization of research on forest tree breeding in Sweden. The Society for Forest Tree Breeding [Foreningen för Växtförädling av Skogsträd], founded in 1936, hoped that centres for breeding and improvement of pine, spruce, birch, poplar, oak and beech might be established in Östergötland, Ångermanland and Västenbotten as well as Dalarna and Skåne.

The application of the following genetical methods to forest tree breeding is illustrated: direct selection followed by individual progeny testing; hybridization and breeding to intensify particular characters; breeding by utilizing cytological knowledge on chromosome effects and polyploidy in particular. The possibilities of using polyploidy in the improvement of pine and spruce should be specially examined.

Tours in Sweden by experts have revealed that what might be called "land races" of pine and spruce and other tree species have been evolved in various localities by natural selection. The best of these types should be brought into cultivation and improved by systematic selection. Selection of the best stands of local races for seed production and the testing of numbers of individual trees of different species for seed collection and also for inheritance studies and progeny tests have been begun. Planting material is being raised from seed from selected mother trees for comparative experiments in various latitudes in Sweden and in the nurseries at Wrams Gunnarstorp there are over 400 progeny of pine and spruce from different regions of Sweden. Quality investigations (with special reference to pine and spruce) are being conducted with the co-operation and financial support of big industrial concerns.

Tours have also been undertaken to study the research in progress on forest tree improvement at various institutes in Copenhagen, Müncheberg and Belgium where work on the poplar in particular is developing on a large scale.

The objects of forest tree improvement are predominantly economic. The immediate aims of the Society for Forest Tree Breeding were described in detail in respect of pine, spruce, birch, poplar, oak and beech by N. Sylvén at the 1937 meeting of the Royal Agricultural Academy [Kungl. Lantbruksakademien].

879. AUSTIN, L.

634.97:575(79.4)

**Forest genetics.**

Rep. Smithson. Instn (1938) 1939 : Publ. 3491 : 433-40.

This is a reprint of the article summarized in "Plant Breeding Abstracts", Vol. VIII, Abst. 971.

880. PJATNITSKII, S. S.

634.972.1:575.127.2

**(Hybridization in oaks).**

Lesnoe Khozjaistvo (Forestry) 1939 : No. 7 : 38-43.

Interspecific hybridization with oaks was started in 1937. Acorns were obtained from the following crosses: *Quercus Robur* x *Q. borealis maxima*, *Q. Robur* x *macranthera*, *Q. Robur* x *Q. macrocarpa*, *Q. macranthera* x *Q. Robur*, *Q. macranthera* x *Q. borealis* and *Q. macrocarpa* x *Q. borealis*. The first to germinate was *Q. macranthera* x *Q. borealis*, followed by *Q. Robur* x *Q. borealis*, the other hybrids being two months later. The first two were also twice the height at the end of the growing season. Those in which *Q. Robur* was one of the parents closely resembled that species, which the author interprets as dominance of the characters of the species most adapted to local conditions. The hybrid *Q. macranthera* x *Q. borealis maxima*, both imported species, was intermediate and characterized by large leaves and great vigour and rapidity of growth; it is of probable interest for cultivation and is being multiplied by cuttings.

The author compares his results with those of Michurin in fruit trees.

881. FOUARGE, J.

634.972.1:576.312.35

**Note sur la caryocinèse chez les chênes pédonculé et rouvre. (A note on karyokinesis in pedunculate oak and sessile oak).**

Bull. Inst. Agron. Gembloux 1939 : 8 : 111-13.

The same chromosome number  $n = 12$  and  $2n = 24$  was found for both species. Size and shape of the chromosomes were the same in both types of oak.

882. BERGSTROM, I.

634.972.3:576.356.5:575

**On the progeny of diploid x triploid *Populus tremula* with special reference to the occurrence of tetraploidy.**

Hereditas, Lund 1940 : 26 : 191-201.

Crosses were made between two triploid gigas forms of *P. tremula* (cf. Absts 883 and 884 below) and a diploid female type, and the results of one of these crosses are reported at length. In a progeny of 91 plants one had the tetraploid somatic chromosome number (76) and the others ranged from the diploid number of 38 to the triploid number of 57, the mode being at  $2n = 50$ . Nine plants had 38 to 39 chromosomes and were therefore approximately diploid. These diploid and approximately diploid derivatives were relatively vigorous and normal in appearance and many of the triploids and hypotriploids exhibited gigas characters, while plants with intermediate aneuploid numbers were lacking in vigour. The tetraploid was vigorous and had large, broad leaves. The usual relationship between stoma size and chromosome number was observed.

In the second triploid x diploid cross no tetraploid plant was found in a progeny of 20 and the plants were of poor development.

883. NILSSON-EHLE, H.

634.972.3:576.356.5:581.6

**Framställning av skogsträd med ökat kromosomtäl och ökad virkesproduktion. (Production of forest trees with increased chromosome number and increased timber production).**

Svensk PappTidn. 1938 : No. 2 : Pp. 5.

During 1936-37 pollinations of the common poplar by the giant form at Svalöf resulted in the discovery of one extremely vigorous plant (out of 60 plants cytologically studied among the 400 surviving plants in the experiment) which proved to be a tetraploid ( $2n = 76$ ). The remaining 59 plants included diploids, aneuploids (with  $2n = 38-57$ ) and some triploids (with 57 or about 57 chromosomes) which were very vigorous specimens. The tetraploid, which is now 83 cm. high, has leaves two-and-a-half times as big as those of the diploid sibs and also bigger than the leaves of the triploid forms.

The practical importance of the tetraploid form is that, on crossing it with the diploid, triploid seedlings of the giant poplar can now be produced at will and such triploids should prove far superior in timber production to the ordinary poplar growing under the same conditions. Whether the tetraploid occurs in nature and whether it has any direct importance as a source of timber still remains to be ascertained from existing tetraploid material and also tetraploid forms from crosses with types from different regions. Once such preliminary studies were complete, systematic hybridization within the tetraploid group could be used in improvement work.

The need for conducting research on the poplar and other forest trees on an adequate scale is strongly emphasized.

884.

NILSSON-EHLE, H.

634.972.3:576.356.5:581.6

634.972.3:575(48.5)

Jätteaspen. Den moderna Svenska skogsförädlingens upptakt. (**The giant poplar—the recent Swedish discovery in forest improvement**).  
Nord. Familjeboks Månadskronika 1938 : 1 : No. 2 : Pp. 6.

A description is given of the stand (probably a clone from root suckers) of *Populus tremula gigas* found in 1935 at Bosjökloster in Skåne. The trees were all male. The giant poplar appeared to be much more successful than the common poplar in competition with the other trees in the neighbourhood. It proved to be triploid. Its superior size and vigour as compared with the ordinary poplar are illustrated and discussed with other distinctive features of the gigas variety, including the very important economic advantage of rot resistance, which has been recorded at Bosjökloster and in Norrbotten. Tests have shown the value of the giant poplar for the match industry and for paper manufacture.

Other finds of giant poplars in various localities in Sweden are recorded and it is of interest to note that the annual rings of the gigas form in a northern region, though smaller than in southern localities, still maintain the same relative superiority in comparison with the ordinary poplar.

The importance of an inventory of the occurrence of giant poplars in Sweden is emphasized and attention is drawn to the variation that exists within the group. Rapid utilization of the new form is facilitated by its capacity for reproducing by root suckers. Large scale production would, however, necessitate also a good output of triploid seedlings obtained by crossing tetraploid and diploid forms.

Tetraploid forms already obtained by the author are expected to flower in 2 or 3 years. The Society for Forest Tree Breeding is working on the same lines. (Cf. Abst. 882 above).

885.

WEIDMAN, R. H.

634.975:575.11(73)

**Evidences of racial influence in a 25-year test of ponderosa pine.**

J. Agric. Res. 1939 : 59 : 855–87.

An extensive study is reported of trees of *Pinus ponderosa* grown in Idaho from seed collected in 20 localities in the western United States. The different progenies were shown to differ markedly in rate of growth and hardiness and there is also evidence that the following characters are heritable: number of needles per fascicle, length of needles, general appearance of the foliage and certain features of the internal structure of the needles. The degree of persistence of the needles was found not to be hereditary. The importance of selecting seed from a suitable region when planting *ponderosa* pine is pointed out.

886.

LANGLET, O.

634.975:581.162.3:575

Om utvecklingen av granar ur frö efter självbefruktning och efter fri vind-pollinering. (**On the development of spruce raised from seed after self-pollination and after open-pollination by the wind**).

Medd. Skogsförsöksanst., Stockh. [1940] : Häfte 32 : No. 1 : Pp. 22.

The results up to date are given in detail of an experiment begun in 1909 by Nils Sylvén on self-fertility in spruce and pine as a preliminary to proposed genetical investigations on type of branching.

In the present study spruce trees obtained from a common mother tree by self-pollination and by wind pollination were compared and the first group were found to have a greater mortality (25% as compared with 0% in the second group), a higher number of trees showing injury (25% as compared with 12% in the second group) and are about 48% shorter. It is of interest to note that those defects from inbreeding have been recorded for about 30 years from the early stages of growth onwards.

In his conclusion the author surveys the relevant findings of other workers in various countries and briefly touches on the possible hereditary basis of the differences in development after self-pollination.

The existing data for the five mother trees and the progeny are examined with reference to any permissible inferences as to the possible genotypic basis of the type of branching, needles and cone-scales, etc.

887. GAVRIS', V. P. 634.975-2.421.9-1.521.6:581.48

**(Selection of immune forms of the common pine).**

Lesnoe Khozjaistvo (Forestry) 1939 : No. 8 : 5-8.

Young seedlings have suffered severely from attacks of *Melanospora pinitorqua* Rost., though the progenies of some trees have been less attacked than others. There was a strong correlation ( $r = 0.94$ ) between resistance and weight of 1,000 seeds; also between resistance and number of cotyledons ( $r = 0.50$ ), which is itself correlated with weight of seed. It has been decided to select all forms whose thousand seed weight is 6 gm. or over.

## VEGETABLES 635

888. BINKLEY, A. M. 635:575(73)

**Plant breeding problem of station. Background of breeding work in horticulture section is outlined.**

Colo. Fm Bull. 1940 : 2 : 8-10.

A brief account of the principles of breeding self-fertilized, cross-fertilized and vegetatively propagated vegetable crops is given and the production of disease-resistant varieties is also discussed, an appeal being made to growers to send in disease-free plants growing in infected areas to the experiment station for testing for resistance. A list of *Fusarium* resistant varieties of vegetables is given.

889. JENKINS, J. M. (jun.). 635:575(73)

**Vegetable improvement problems in the South.**

Market Gr. J. 1940 : 66 : 115-16.

Some of the outstanding problems of vegetable breeding in the southern United States are outlined. Tomato varieties with heavy foliage to shade the fruit, fruit held clear of the ground, resistance to various diseases, nematodes and insect pests, earliness and ability to colour up even at high temperatures are desired. In the case of sweet corn, resistance to the corn ear worm combined with high quality is the outstanding requirement. Cabbages for the south may perhaps be improved by crossing with collards. Other problems include breeding for disease resistance in lima beans, cucumbers, peas, water-melons and other crops and the development of vegetables which will grow well in the hot, humid summer months.

890. SALVO, C. 635:575(75.7)

**Regional vegetable breeding for the Southeast.**

Agrarian, Clemson, S.C. 1939 : 1 : No. 2 : 19, 36.

This is a brief account of the organization of the United States Regional Vegetable Breeding Laboratory, established in 1936 at Charleston, S.C. The Laboratory is engaged in fundamental research and breeding work on vegetables for the southern States and aims also to supply breeding material to other experiment stations. Work at present under way includes the production of snap bean varieties resistant to common and halo bacterial blights; breeding tomatoes with a longer fruiting season, cabbages which are winter-hardy and disease resistant and water-melons resistant to anthracnose and wilt and the production of sweet corn resistant to earworm attack by hybridization with resistant dent corn. Much genetical work is also being conducted.

891. CORNS, J. B. 635:575.12:575.125

**Hybrids in vegetable breeding with special reference to sweet corn and tomatoes.**

Market Gr. J. 1940 : 66 : 117, 120-24.

The outstanding breeding work of recent years on a number of vegetable crops is reviewed, with particular reference to work in America. Breeding for disease resistance and the direct use of  $F_1$  seed in such crops as the tomato, cucumber and egg plant are among the topics specially discussed. The other crops dealt with at some length are musk-melons, potatoes and sweet corn. Most of the work referred to has been summarized in past issues of "Plant Breeding Abstracts".

892. ZAGORODSKIKH, P. 635.13:576.16

**New data on the origin and taxonomy of cultivated carrot.**

C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : 25 : 520-23.

The author gives the cultivated carrot specific rank, naming it *Daucus sativus*, and recognizes five sub-species, *afganicus*, *syriacus*, *cilicicus*, *mediterraneus* and *japonicus*.

The earliest cultivated form is the purple carrot (subsp. *afganicus*) cultivated most widely in Central Asia and most diverse in the region of Afghanistan. This was developed directly from wild forms and has anthocyanin pigments in the cell sap of the root.

This Afghan carrot migrated westwards. In Syria and the surrounding semi-arid regions it gave rise to a densely pubescent, drought-resistant type, subsp. *syriacus*. In Asia Minor hybridization with the wild species *D. maximus* took place. The Cilician carrot (subsp. *cilicicus*) is especially distinct. It has yellow or white roots which may contain anthocyanin and anthochlorine and perhaps small quantities of carotin and lycopene pigments.

In the Mediterranean region a white carrot was developed from local wild forms. By hybridization with cultivated Afghan types, a yellow form which lacked anthocyanin pigments evolved. Further hybridization with wild forms gave the familiar red carrot, the pigment of which is carotin.

The Mediterranean red carrot was introduced into Japan and there hybridized with the Afghan type to give forms with blood-red root surface and flesh, caused by the presence of lycopene pigments. This type is grouped as subsp. *japonicus*.

893. BAILEY, L. H. 635.3:582

**Certain noteworthy Brassicas.**

Gentes Herbarum, Ithaca, N.Y. 1940 : 4 : Fasc. 9 : Art. 26 : 319-30.

A new key to the species of *Brassica* is given and five new species are described (four of them previously recognized as varieties). These are: *B. fimbriata*, including the common kitchen kale, dwarf Siberian kale and Scotch kale; *B. perviridis* tendergreen; *B. septiceps*, the seven-top turnip; *B. Ruvo*, previously known as Rapa Ruvo, and *B. purpuraria*, a Chinese potherb.

894. BREVIGLIERI, N. 635.35:575.11

**Note di genetica del cavolfiore e miglioramento della coltura. (Notes on the genetics of the cauliflower and improvement of its cultivation).**

Boll. Soc. Tosc.ortic. 1937 : 62 : 46-48.

Reference is made to the work of Morettini (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 1384).

It has been found that the cauliflower will cross with other members of the cabbage group belonging to the species *Brassica oleracea* L. but not with *B. Rapa* or *Raphanus sativus* L. In crosses with the other cabbages the cauliflower characters are recessive.

A distance of about 400 m. is necessary for spatial isolation.

Hybrids between different cauliflower varieties are intermediate in time of reaching ripeness for market, segregation occurring in the  $F_2$ .

The three varieties studied were self-sterile, though not completely so; better sets were obtained by pollinating with pollen from other plants of the same variety and better still with pollen from other sub-species. Most of the plants obtained from selfing bred true for the maternal type. No incompatibility between varieties was observed.

Extensive variety tests have been carried out with cauliflower. The local varieties, though less homogeneous, proved superior and have been subjected to selection.

895. DREWES, H. 635.41:575(73)

**Spinach growing in the U.S.**

Market Gr. J. 1940 : 66 : 51-53.

The spinach breeding work in progress in the United States is outlined. The main objectives are: the elimination of unproductive "extreme male" plants from varieties, breeding types resistant to bolting and to mosaic or blight, blue mould (*Peronospora effusa*) and curly top, as well as, of course, improvement in plant type, colour, yield and quality.

896. REIMERS, F. E. 635.52:575.42:581.143.26.035.1

**Phasic development in various biological groups of *Lactuca sativa* var. *capitata*.**

C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : 25 : 790-93.

The lettuce (*Lactuca sativa*) varieties Ideal and Eier Gelber, stocks of which appeared to be

quite uniform when grown under conditions of normal day length, appeared very variable with regard to time of bolting when grown under short day conditions. It was possible to select lines showing greater uniformity and having either a longer or a shorter vegetation period than the original stock.

897.

KREBČENKO, L. E.  
(**Breeding cucurbits**).

635.61:575(47)

635.62:575(47)

Ovošćevodstvo (Vegetable Growing) 1939 : No. 12 : 30-34.

Crosses between the exceptionally productive water-melon variety Cuban King with a high quality variety Koreiskii have produced two varieties of high quality exceeding both parents in yield.

Musk-melons of good flavour combined with resistance to anthracnose have been obtained by crossing local with Asiatic forms.

Gourds with high dry matter content and up to 11.5% sugar have been produced and are regarded as highly suitable for stock feed and for ensilage.

A good standard melon has been attained by pollinating the ordinary melon Kolkhoznitsa with the standard but low quality variety Takhmi. Experience has shown that the progenies of different F<sub>1</sub> plants of the same varietal combination segregate differently and they are now dealt with separately.

898.

ARARATIAN, A. G.

635.61:576.312.34

635.61:576.356.5

**A contribution to karyological knowledge of melons.**

C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : 25 : 777-80.

A number of varieties of cultivated melons (*Cucumis Melo*), the wild melon found in Armenia (*C. agrestis*) and a Chinese melon (*C. chinensis* Pang.) were studied cytologically. There was some variation of the karyotype, but the cultivated forms showed 3-4 chromosome pairs with median centromeres, 7 to 8 with sub-median to sub-terminal centromeres and one pair with sub-terminal centromeres and satellites, the total diploid number being 24. The theory of Kozhukhov that the chromosomes of the melon were telocentric and derived from those of the cucumber, which has 14 larger chromosomes, by fragmentation is therefore shown to be erroneous.

In the Chinese melon satellites could not be detected, though the possibility of their presence could not be excluded.

Other cytological phenomena observed were (1) the presence of tetraploid cells with paired or scattered chromosomes in the root meristem as found in the radish (cf. "Plant Breeding Abstracts", Vol. X, Abst. 242) and elsewhere and also recorded in *Hippophaë* and *Eleagnus* by the author (unpublished data), (2) persistence of the nucleolus during cell division and (3) a lagging chromosome at mitosis.

899.

HOFFMAN, I. C.

635.64:575(77.1)

635.52-2.19-1.521.6:575(77.1)

635.63:575(77.1)

**Progress in greenhouse vegetable breeding.**

Proc. 25th Annu. Mtg Ohio Veg. Potato Gr. Ass. 1940 : 103-06.

Tomato breeding work at the Ohio Agricultural Experiment Station has led to the production of three widely used types, Marhio, a selection of Livingston's Globe and a second Globe selection, Strain A, which is an improvement on the first in fruit shape. A new selection of Marhio with a better type of plant and deeper fruits has also been made and is rapidly replacing the original strain in greenhouse use.

Several F<sub>1</sub> hybrids between Globe strains have been made and one in particular gives promise of increased yields, but it is doubtful if it will be in much demand owing to the increased cost of the seeds. Hybrids involving Marhio have so far not outyielded Marhio itself.

New types produced by colchicine treatment are being tested.

Attempts are also being made to produce leaf lettuce strains of the Grand Rapids type which are resistant to tip burn. Occasional resistant plants have been selected and multiplied and several apparently resistant strains are now under test.

Inbred lines of the cucumber varieties Abundance, Danish, Belleville and Straight 8 have been made and tested. Numerous hybrids and one double cross have been made but they have not

yet proved satisfactory under commercial conditions. Two selections from the local cucumber variety Danish have been made but they may be too long to suit many growers and further selection is being carried out.

900. SELIVANOVA, A. N. and 635.64:575"793":581.6  
ALPAT'EV, A. V.

**(Early varieties of tomato for the conserving industry).**

Ovošćevodstvo (Vegetable Growing) 1939 : No. 12 : 34-36.

Hybrids whose fruit began to mature 5 to 8 days before Bison, the local early standard, have been obtained by crossing with early parents. The new hybrids have surpassed the existing varieties in yield, disease resistance and quality for preserving. The most promising have come from the crosses Bison x Break-o'-day, Break-o'-day x King of the Earlies and Break-o'-day x Ljubimets Kolkhoza [Kolkhoz Favourite]. A dwarf hybrid with fruits weighing 80 to 100 grm., maturing 5 to 8 days earlier than Bison has been obtained from the cross Bison x Štambovyí Alpat'eva [Alpat'ev's Standard].

The new early forms have considerably extended the working season of the factories.

901. 635.64:575.11-18:581.44

HOUGHTALING, H. B.

635.64:575.127.2

**Stem morphogenesis in *Lycopersicum*: a quantitative study of cell size and number in the tomato.**

Bull. Torrey Bot. Cl. 1940 : 67 : 33-55.

A study was made of inbred lines of the *L. esculentum* varieties Bonnie Best, Red Cherry and Dwarf Champion, of one line of *L. pimpinellifolium* (Red Currant) and of three of their hybrids. With regard to diameter of stem, the F<sub>1</sub> hybrids Bonnie Best x Red Currant were intermediate between their parents. In the F<sub>2</sub> there was a complicated segregation of fruit size and there was a correlation between large fruits and thick stems.

The genes which control stem diameter appeared to have no influence on internode length. Differences in the rate of growth of various stem tissues are discussed. Differences in size of cortical and pith tissues are due to different cell numbers. The hybrids are intermediate between the parents for this character and segregation is apparent in the F<sub>2</sub>. No F<sub>2</sub> plant lay outside the range of the parents.

902. YOUNG, P. A. 635.64:575.243.061.6:581.46:537.531

**White-flower character from X-ray treatment of tomato seed.**

J. Hered. 1940 : 31 : 78-79.

A white-flowered mutant was found among plants grown from X-rayed seeds of the Marglobe variety. It proved to be a simple recessive (y) to the normal yellow (Y) and promises to be valuable as a genetic marker for disease resistant selections.

903. BOHN, G. W. and 635.64-2.484-1.521.6:575(77.8)  
TUCKER, C. M.

**Studies on Fusarium wilt of the tomato. I. Immunity in *Lycopersicon pimpinellifolium* Mill. and its inheritance in hybrids.**

Res. Bull. Mo. Agric. Exp. Sta. 1940 : No. 311 : Pp. 82.

This is a very full account of the researches previously reported in the brief article summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 1652.

904. VIRGIN, W. J. 635.64-2.8-1.521.6:575.127.2

**The Chilean tomato, *Lycopersicon chilense*, found resistant to curly top.**

Phytopathology 1940 : 30 : p. 280. (Abst.).

Tests have shown that *L. chilense* is highly resistant to curly top and attempts are being made to incorporate this resistance in several varieties of the common tomato.

905. PEELING, B. A. 635.648:581.49:575.42(75.7)

**Clemson spineless okra.**

Agrarian, Clemson, S.C. 1939 : 1 : No. 2 : p. 11.

The new okra (*Hibiscus esculentus*) variety, which has spineless pods, was developed from a strain found in South Carolina. It is high-yielding and has sparse foliage which makes harvesting easier.

906. JARETZKY, R. and SCHENK, G. 635.65:581.04:576.35:576.16  
Versuche mit Acenaphten und Colchicin an Gramineen- und Leguminosen-keimlingen. (**Experiments with acenaphthene and colchicine on seedlings of Gramineae and Leguminosae**).  
Jb. wiss. Bot. 1940 : 89 : 13-19.  
Acenaphthene and colchicine treatment of *Phaseolus vulgaris*, *Pisum sativum* and *Lens esculenta* showed that though both substances can produce similar effects upon cell division they differ in the type of reaction produced and the stage at which it takes place.  
Possible systematic and phylogenetic implications of these findings are also mentioned.
907. 635.652:575(73)  
**New Plentiful bean variety.**  
N.J. Hort. Soc. News 1940 : 21 : p. 1176.  
The new *Phaseolus vulgaris* variety Plentiful is derived from a cross between the Bountiful flat green bean and Surecrop Stringless Wax. It will mature in 50 days in New Jersey and is very high-yielding. The pods are flat, medium green and stringless at all growth stages.
908. POPESCO, C. 635.652:575.061.1:581.143.26:575.322  
Obtention par greffe d'une race tardive et vivace de haricot de Soissons. (**Obtaining by grafting a late and perennial race of the Soissons variety of bean**).  
C.R. Acad. Sci. Paris 1940 : 210 : 446-47.  
Ten years of observations on grafts of *Desmodium canadense*, a perennial, on the annual type, Soissons, of *Phaseolus vulgaris* provide, in the author's opinion, an irrefutable instance of the inheritance of an acquired character—the plant used as a stock having acquired the perennial habit and late development with tuberous tap roots as a consequence of the graft.
909. LAMPRECHT, H. 635.652:575.11.061.6:581.48  
Zur Genetik von *Phaseolus vulgaris*. XV. Über die Vererbung der Mehrfarbigkeit der Testa. (**On the genetics of *P. vulgaris*. XV. The inheritance of particoloured testa**).  
Hereditas, Lund 1940 : 26 : 65-99.  
Four types of particoloured seed coat are recognized by the author—striped, homozygous marbled, heterozygous marbled and sprinkled. The genes for striped and constant ("homozygous") marbling had previously been designated S and M. It is now shown that these genes are multiple allelomorphs of the gene  $R$  for light roseate seed colour, and they are symbolized as  $R_{st}$  and  $R_{ma}$  respectively. The new type, sprinkled, is shown to be determined by another allelomorph of this series,  $R_{res}$ . The  $R$  locus is strongly linked to the seed coat colour gene  $C$ . Heterozygous marbling of the seed coat is caused by heterozygosity in either  $C$  or  $R$ .  $Cc$  marbling is always strong, while  $Rr$  marbling is more or less indistinct. Furthermore  $Cc$  marbling never occurs in the same colours as constant marbling caused by the gene  $R_{ma}$ , since this latter gene also determines red colour.
910. BARRONS, K. C. 635.652-2.6-1.521.6:575.113.4  
**Root-knot resistance in beans.**  
J. Hered. 1940 : 31 : 35-38.  
A genetic analysis of crosses between Alabama No. 1, a variety of *Phaseolus vulgaris* resistant to root-knot caused by the nematode *Heterodera marioni*, and the susceptible bean variety Kentucky Wonder shows that resistance is a double recessive character. The two genes concerned apparently interact quantitatively, plants with four recessive alleles being resistant, those with one dominant intermediate and those with two or more dominants susceptible. The  $F_2$  ratio is thus 11 : 4 : 1 and there is no true-breeding intermediate group.
911. WADE, B. L. and ZAUMEYER, W. J. 635.652-2.8-1.521.6:575.113.4  
635.652:581.47:581.6:575.113.4  
**Genetic studies of resistance to alfalfa mosaic virus and of stringiness in *Phaseolus vulgaris*.**  
J. Amer. Soc. Agron. 1940 : 32 : 127-34.  
The parents used in this study were a strain of the Corbett Refugee bean known as Mosaic Resistant Refugee Rogue (resistant to alfalfa mosaic virus 1 and stringless) and Idaho No. 1 Mosaic Resistant Great Northern (susceptible to the virus and stringy). Studies on the  $F_2$  and  $F_3$

showed that resistance to the virus was determined by two dominant duplicate genes, giving a 15 : 1 ratio of resistant to susceptible in  $F_2$ . Stringlessness was determined by two complementary pairs of genes, the  $F_2$  ratio being 9 stringless : 7 stringy. There was no indication of linkage between the two characters studied.

912.

635.653:575(77.3)

HUELSEN, W. A.

635.653:581.162.32

**Three new varieties of bush lima beans : Baby Potato, Early Baby Potato, and Illinois Large Podded.**

Bull. Ill. Agric. Exp. Sta. 1939 : No. 461 : 107-20.

Attempts have been made at the Illinois Agricultural Experiment Station to produce lima bean varieties suitable for various market requirements and combining the good quality of Fordhook with the yielding ability of Henderson. Three varieties partially fulfilling these requirements have now been released.

The Early Baby Potato and Baby Potato varieties were both developed from a natural hybrid between Henderson and a potato lima variety. The earlier variety ripens at the same time as Henderson while the other is a week later. Both varieties have plump seeds and pods which are uniform in maturity and suited to mechanical shelling and have excellent canning quality, resembling Fordhook somewhat in flavour. In yield they equal or exceed Henderson and they are well suited to canning and freezing.

Illinois Large Podded is a variety suitable for the market gardener. It has large, flat beans, easily shelled and of uniform maturity. In quality it is acceptable though not equal to Fordhook. Yields have been comparatively high. The variety was developed from a cross between two strains of Henderson.

It is noted that under Illinois conditions a considerable amount of cross-pollination occurs in the lima bean and since the seed set under cheese-cloth covers has proved unsatisfactory, special methods have had to be adopted to prevent unwanted crossing. These consist principally of growing several rows of maize between adjacent plots.

913.

KOVARSKII, A. E.

635.654:575.127.2:575.322

**(The process of form development in interspecific hybrids of cow-peas under the influence of different conditions of environment).**

Selektsiya i Semenovodstvo (Breeding and Seed Growing) 1939 : Nos 10-11 : 9-13.

*Vigna sinensis* was pollinated with *V. Catjang* in 1935, four full pods being obtained from one plant. The seeds were sown at different times and under different conditions of spacing and irrigation. The characters of *V. Catjang*, which is the closer of the two species to the wild type, were mostly dominant. These included vigour of growth, twining habit and earliness; the early plants were also resistant to mosaic. Dark green, bluish coloured leaves were dominant in early sowings, light green in later sowings; and dark mottled seeds were dominant in dry sowings, yellow in irrigated sowings, late sown plants having lighter seeds than early sown. These observations are interpreted according to Michurin's principle that the biologically most efficient characters are dominant.

A greater proportion of seeds of the *V. Catjang* type of grey coloration is reported in the  $F_2$  plants from the  $F_1$  sown densely in spring than from those sown in summer; differences in other characters such as size of seed and form and colour of pod are also reported. It is concluded that by appropriate choice of growth conditions for the  $F_1$  it will be possible to produce forms of cowpea suitable for cultivation in the U.S.S.R., without the necessity for further selection in the  $F_2$  and later generations.

914.

YORK, H. A.

635.655:575(76.2)

635.655.00.14

**Growing soybeans in the Yasoo-Mississippi Delta.**

Bull. Miss. Exp. Sta. 1939 : No. 331 : Pp. 32.

The results of a number of variety trials are tabulated and descriptions are given of a considerable number of soya bean varieties, together with details of their origin.

Soya bean breeding is one of the major activities of the Delta Branch Experiment Station, Stoneville, Miss. Among the varieties so far distributed are Tanloxi, Mamredo, Mamloxi, Delsta and White Biloxi. The Mamotan variety, not yet available to farmers, is a very prolific variety developed from the cross Mammoth Yellow x Ootootan which is a desirable type for both hay and beans.

The main objectives of soya bean breeding at the Station are high yields, high germinating ability of the seeds, freedom from shattering and suitability for alternative uses. Varieties suited to different soil types are being bred.

915.

**The Clemson soy bean.**

Agrarian, Clemson, S.C. 1939 : 2 : p. 28.

The new soya bean variety is a selection made in South Carolina from a stock introduced from China by the United States Department of Agriculture. It is very high yielding but has a tendency to shatter.

635.655:575.42(75.7)

916.

BOLHUIS, G. G.

635.655:581.162.32

Natuurlijke kruisbestuiving bij kedelee. (**Natural crossing in soybeans and the results of experiments on this subject made in Java**).

Landbouw 1940 : 16 : 119-28.

In addition to a survey of previous research on the subject observations on the morphology and biology of the soya bean are presented.

The writer's own results showed that varietal differences in the extent of natural crossing are considerable, e.g. the percentage hybridization for variety No. 30 (Manchurian type) in general exceeded 0.5, while for variety No. 336 (Indian type) it was only a fraction of that value and very low. Woodworth's conclusions on the effect of spacing on cross-pollination were not confirmed.

In growing Indian types the border rows should be cut away to prevent cross-pollination, but in the inner rows no precautions will be needed as the chances of natural hybridization are practically nil. Roguing will however have to be regularly done when a Manchurian variety is grown beside an Indian type flowering simultaneously. When growing several varieties together it is best to ensure, as far as possible, that those flowering at the same time should not be adjacent to each other.

The use of pedigree seed of the Manchurian types is also recommended.

917.

ŽOGOLEV, A. M.

635.656:575(47)

635.656-2.112-1.521.6:575(47)

(**A new variety of pea—"Novo-Urenskii 01253"**).

Selektsija i Semenovodstvo (Breeding and Seed Growing) 1939 : Nos 10-11 : p. 30.

The new variety, produced by individual plant selection, is drought resistant, has large uniform seeds and high yield.

918.

TRAIL, F.

635.656:575(73)

**Selection of pea strains to meet western needs.**

West. Cann. Pack. 1939 : 31 : No. 12 : 9, 23.

The requirements governing pea breeding programmes in the western United States are outlined. Among the points mentioned is the fact that quite different plant types are required for growing to the west and east of the Cascade Mountains, and on dry and irrigated land to the east. In some parts the occurrence of nightshade as a weed necessitates the use of large-seeded varieties that can be separated from the nightshade berries by sieving.

919.

HOPKINS, T. T. and

635.656:581.6:575

SAWIN, J. L.

635.652:581.6:575

**Characteristics desirable in peas, beans and corn for canning and freezing.**

West. Cann. Pack. 1939 : 31 : No. 12 : 13-16, 22.

The desirable characteristics of peas, beans (*Phaseolus vulgaris* and *P. lunatus*) and sweet maize for canning and freezing are listed for the information of growers and breeders. Considerable attention is paid to the preferences of consumers as regards quality.

920.

WEIMER, J. L.

635.656-2.4-1.521.6:575:578.08

**Methods of value in breeding Austrian winter field peas for disease resistance in the South.**

Phytopathology 1940 : 30 : 155-60.

The devices described are an electrically heated and controlled hotbed to enable tender varieties to be grown in the winter, a cheesecloth cage with supplementary electric light to induce flowering and fruiting and a method of artificial inoculation of potted plants with *Ascochyta* and *Mycosphaerella*.

## BOOK REVIEWS

02

Bibliothèques agricoles dans le monde et bibliothèques spécialisées dans les sujets se rapportant à l'agriculture. (**International directory of agricultural libraries and of libraries specialized in subjects related to agriculture**).

Int. Inst. Agric., Rome 1939 : 25 Lire. Pp. xvi + 311.

In view of the ever increasing specialization in the sciences, pure and applied, which characterizes the present era, the International Institute of Agriculture in Rome is to be highly congratulated on the compilation of this bilingual directory which provides information in both English and French on agricultural libraries, or agricultural sections of libraries, and on centres of agricultural documentation in the Old and New World.

The information for the directory was obtained mainly by means of a questionnaire and the responsibility for any lacunae which the editors (though patient and tenacious) were unable to fill must lie with any contributors who may have failed to co-operate fully in the valuable work.

Though the greater part of the data obtained refers to the year 1935 or 1936, some which had to be obtained from other sources (such as *Minerva* and the *Index generalis*) cover more recent years up to 1938. Differences of this kind are unavoidable and should not impair the usefulness of the directory which, but for possible devastations due to the war, could be regarded as being as up to date as by its nature such a work can be.

The aim has been to give as far as possible for every library: its history, a description of the collection (including special collections), mode of administration, facilities for users, borrowers (both home and foreign), publications edited by the library and bibliography of writings on the library.

Admirable bilingual indexes, lists of abbreviations and a concise explanation of certain conventions adopted for brevity conclude this extremely useful reference book.

ARKIN, H. and

COLTON, R. R.

519.24

**Statistical methods as applied to economics, business, education, social and physical sciences, etc.**

Barnes and Noble, Inc. New York 1938: 3rd ed. \$1.75, paper edition \$1.00. Pp. 228 + 47. 36 figs. 42 tables.

This book is directed to students of business and sociological studies with no great mathematical knowledge. Clearly such a reader demands a complete and concise description of any mathematical methods that are indispensable to him, but the language of the book is sometimes so condensed as to defeat this end. It begins with chapters on means and measures of dispersion; goes on to time series, least squares and correlation. A chapter each on the normal curve and theory of sampling follow; excellent summaries of methods of collection and presentation and an interesting account of certain special techniques conclude the book.

Chapter XII on the normal curve is particularly unsatisfactory. The opening definitions of probability, omitting as they do the concept of "equally likely" are to be condemned. The "product" and "sum" law are also badly presented, while the section on  $(p + q)^n$ , p. 108, is vague. The areas of the "normal" curve for range  $\sigma$  and  $2\sigma$  are quoted on p. 39 before the normal curve has been defined, and moreover the figures given are wrong in the last place of decimals. The grammatical and logical construction of certain particular sentences is also open to criticism. By contrast the chapter on sampling distributions is a good exposition, though misprints of "10,000" for "1,000" on p. 119 and "as" for "is" on p. 123 could be very misleading. In general Chapter XI on least squares is well presented.

There are some further errors: -In the histogram the class frequency is stated to be represented by the ordinate instead of the element of area, pp. 3, 167; the distinction between kurtosis and dispersion (p. 9) is insufficiently explained: the statement (p. 102) "If there is no association there will tend to be an equal number in each box" is false and the argument which is used to establish this result betrays confused thinking. The standard error of  $\bar{X}$  given on p. 127 is valid only if  $\sigma_x$  is small compared to  $\bar{X}$ . The same applies to  $X_1X_2$  and  $\frac{X_1}{X_2}$  in the

succeeding sections. The reference table to standard textbooks should prove very useful; and a very complete bibliography is supplied with each chapter. The technical appendices are often good though V might be better arranged and in IX the notation is confusing. Tables of the ordinate and area of the normal curve are given, and a brief table of  $t$ . There is also a table of logarithms but no antilogarithms and an extensive table of squares, cubes and square roots.

H. M. F.

CROXTON, F. E. and

COWDEN, D. J.

519.24

**Applied general statistics.**

Prentice-Hall, Inc. New York 1939 : \$4.00. Pp. xviii + 944 + xiii. 180 tables. 257 charts.

This is a compendious and generally very good book dealing exclusively with business and sociological statistics. There are opening chapters on the collection, tabulation and graphical presentation of data and then the frequency distribution is discussed and its specification by measures of location, dispersion and skewness is considered. A very complete account of the analysis of time series is given and finally of index numbers and correlation.

The book can be recommended especially to the non-mathematical reader; essential mathematical processes are presented at length and well illustrated by examples. The authors are evidently most at home in the chapters on practical aspects. Chapter 4 on graphic presentation and Chapter 6 on charts are excellent and the treatment of index numbers is thorough. Chapter 12 on the significance of means is also excellent; Chapter 13 on other significance tests is rather condensed but adequate.

There are points where the high standard of clarity is not maintained; for instance, the term "amount of increase" for  $\frac{\Delta y}{\Delta x}$  and "rate of increase" for  $\frac{1}{y} \frac{\Delta y}{\Delta x}$  are unfortunate and make the

whole of Chapter V concerning logarithmic paper very confusing.  $\frac{\Delta y}{\Delta x}$  is a "rate of increase"

and  $\frac{1}{y} \frac{\Delta y}{\Delta x}$  is a "proportional rate of increase". The account of the binomial distribution suffers from logical and grammatical looseness, the statement on p. 271 that "as  $m$  becomes infinitely large  $(\frac{1}{2}t + \frac{1}{2}h)^m$  becomes identical with the normal curve of error" is undoubtedly lax; equally so (p. 287) is "the expansion of  $(\frac{1}{2} + \frac{1}{2})^m$  can be produced experimentally by tossing coins".

The later chapters on correlation depart from the non-mathematical tendency and are somewhat overloaded with symbols; the mathematical appendix is rather evasive, many of the proofs being loose or too long. But these are minor criticisms. A very complete appendix of the normal  $\chi^2$ ,  $t$ ,  $z$ , variance ratio and other tables is given, also a table of logarithms. The glossary of symbols is useful but would be better if cross-references were made.

H. M. F.

DAHLBERG, G.

519.24

**Statistical methods for medical and biological students.**

George Allen and Unwin, Ltd., London 1940 : 10s. 6d. Pp. 232. 13 figs. 26 tables.

The writing of an elementary text-book on statistics for medical students, which does not demand great mathematical knowledge, has become increasingly necessary. The present author has succeeded in presenting the subject without using any but the most elementary algebra, while at the same time making clear the principles which any sound user of statistics must understand. The subject is descriptively treated, and the methods are explained in great detail, so that small points which often trouble beginners are not overlooked. On the other hand, formulae which are useful, but require much algebra to obtain them, are stated without proof. The author has had much experience in the statistical handling of medical data, and gives numerous examples which should be of great interest to the student, besides showing how best to get information from the data. The book begins with a thorough discussion of probability, leading on to the binomial distribution and normal curve. Then follow the usual measures of location and dispersion. In dealing with comparison of data, exact tests are not used; in every case large sample theory is used for tests of significance. There seems no reason why, for instance, the Z-test should not be used for comparison of standard deviations, since the usual significance levels are tabulated.

If the significance of grouped data is in doubt, it would seem better not to use Sheppard's correction but to use finer grouping. The variability due to groups of factors, and random and systematic errors, is well explained.

The chapter on Defects of Materials is particularly useful, in showing the necessity for getting representative data. With measures of asymmetry and disymmetry, there is also a full discussion of the causes producing such characteristics of data, and their effect on tests of significance. Correlation is well treated, though it seems that tetrachoric and Bernoullian correlations are unnecessary in a work of this kind, particularly as  $\chi^2$  can be used in testing independence in  $2 \times 2$  tables. The use of  $\chi^2$  would also be simpler than the use of standard errors for testing differences of probabilities (p. 140), and has been inadequately treated. There is a small error on p. 26, where the probability of both twins being born alive should be

$$\left(1 - \frac{1}{a}\right)^2.$$

Also, on page 94, the formula for the standard error of a square root should read

$$\epsilon(\sqrt{M}) = \pm \frac{\epsilon(M)}{2\sqrt{M}}.$$

On the whole, this is an excellent book, and should prove of great value in acquainting medical students with statistics, as applied to problems they are interested in. E. J. W.

SHEPPARD, W. F.

519.24

**British Association for the Advancement of Science Mathematical Tables: Volume VII. The probability integral.**

University Press, Cambridge 1939: 8s. 6d. Pp. xi + 34. 6 tables.

The tables of the probability integral are based on the work of the late Dr. W. F. Sheppard, a pioneer in mathematical statistics. The integral is perhaps better known to biologists as the tail area of the normal frequency distribution and is of great importance in statistical work. Of its manifold application we need only mention the test for the significance of the difference between two means of large samples.

The tables under review are of a much higher accuracy than any existing one and the tail area may be obtained correct to up to 24 places of decimals. Such accuracy is, of course, not required for ordinary routine tests. There are, however, problems (mainly physical in character) for which the validity of the normal law of frequency has to be established to a high degree of accuracy in order that rigorous conclusions may be drawn from the theory. For such purposes this new and fundamental table will be essential. H. O. H.

LEONARD, W. H. and

519.24:631.421

CLARK, A. G.

**Field plot technique.**

Burgess Publishing Company, Minneapolis, Minn. 1939: \$3.25. Pp. ii + 271.

Tables (Mimeographed).

This is another addition to the rapidly growing number of books on statistical methods for experimenters, and is based on a series of lectures given to agricultural college students. It is intended by the authors to be of use both as a class book and as a source of reference for technical workers, and assumes no previous knowledge of statistics on the part of the reader. In the authors' words, "the aim has been to lead the student to understand the formulas he applies, without necessarily being able to derive them mathematically".

The book is divided into three parts, with an appendix of the usual tables required for the common tests of significance. The first Part is purely introductory, and contains a good deal which could have been omitted without detriment to the value of the book; Parts II and III contain the main subject matter and are devoted respectively to a presentation of the common statistical procedures and the application of these to field experimentation. The various sections are well illustrated with numerical examples.

Part II deals first with frequency distributions, leading to tests of significance with large and small samples. The concepts of linear correlation and regression, and the simple analysis of variance of data classified according to two criteria are then introduced. The final chapter in Part II briefly presents the technique of the analysis of covariance.

Part III is concerned with the practical application of the principles outlined in Part II and follows the usual lines. Beginning with a discussion of soil heterogeneity, and the advantages to be obtained from "block control", the size and shape of plots and the value of replication

are dealt with. This leads on to the design of simple experiments—randomized blocks and Latin squares—and the appropriateness of each to certain types of trials. Formulae for evaluating “missing plots” are given at this stage. Thereafter follow chapters on sampling, the combination of results from various centres, “split plots”, confounding in  $2 \times 2 \times 2$  experiments, and the recently evolved “symmetrical incomplete blocks” type of layout; the section concludes with a discussion of practical procedure in field trials.

There are a number of points omitted which one would have liked to see mentioned in a book of this nature. Thus, the partition of degrees of freedom could well have been dealt with at greater length; non-linear regression is not introduced, nor, despite reference to factorial experiments, is the popular  $3 \times 3 \times 3$ , or 27-plot, layout mentioned. As the title suggests, the book is restricted to field experimentation technique, and there is unfortunately no mention of the application of statistical methods to animal experimentation. This seems to be an all too common failing, which perhaps one day some author will put right.

The problems which follow each chapter are useful in providing practical work and the numerous references are especially worthy of commendation; this, unfortunately, cannot be said of the “questions for discussion”.

As regards the general layout of the book, the mimeographed text is not well suited to the presentation of formulae and equations; some of the sections are consequently not as clear as could be desired and the presentation lacks the clarity which printed type provides.

R. W. S.

PIERANTONI, U.

57

Nozioni di biologia (compresa la genetica e la biologia delle razze).

[**Principles of biology (including genetics and biology of races)**].

Unione Tipografico-Editrice Torinese, Torino 1940: 2nd ed. 95 Lire.

Pp. xvi + 633. 403 figs.

Starting with general discussions of the nature of living matter and of living beings, and of vital reactions such as tropisms, this text book of biology for Italian readers devotes extensive chapters to cellular morphology and physiology, to cell and nuclear division, the phenomena of sexuality in lower organisms, higher plants and animals, heredity and cytology. The Mendelian laws are described and related to the behaviour of the chromosomes, special consideration being given to the inheritance of sex, and to the phenomena of variation, fluctuation and mutation. Questions of adaptation, mimicry, the species concept and evolution are also discussed, though without reference to recent work, Bateson being taken as representative of the “modern genetic authorities”.

The volume is admirably illustrated and terminates with a bibliography and index.

SNYDER, L. H.

575.1

**The principles of heredity.**

D. C. Heath and Company, New York 1940: 2nd ed. \$3.50. Pp. xv

+ 452. 164 figs. (George G. Harrap and Co., Ltd., London).

This text-book of genetics follows fairly familiar lines, including an outline of the statistical methods employed in genetical studies.

The book is probably most suitable for those likely to be interested in human heredity, which seems to be the branch of genetics with which the author is most familiar, though some of the statements made in the chapter on eugenics are questionable. The cytological parts are disappointing. For instance meiosis is said to comprise a “reduction” division and a mitosis; the classical and neo-chiasmotypy (two-plane and one-plane) theories of crossing-over are presented as though it is still doubtful which is correct; the illustration on p. 203 would be better omitted in view of the doubtful reality of the size differences among the chromosomes of *Aesculus carnea* (cf. “Plant Breeding Abstracts”, Vol. VII, Abst. 476); the illustration on p. 85 is not, as stated, of the haploid complements but of the first division of meiosis, the chromosomes shown being bivalents; on p. 201 it is stated that “it is usually not possible to detect . . . an inversion cytologically”, whereas in truth heterozygous inversions are relatively easy to detect by their characteristic configuration of a bridge and fragment at first anaphase of meiosis produced by a chiasma within the inversion.

A good index is provided.

575.42:519.24  
633.15:575(59.7)  
633.853.55:575(59.7)  
633.854.56:575(59.7)

LARROQUE, P.

De l'utilisation de la statistique mathématique pour la sélection rapide des plantes (applications à la sélection des maïs, des ricins et des abrasins). [On the utilization of mathematical statistics for the rapid selection of plants (applications to the selection of maize, castor oil plant and tung trees)].

Inst. Rech. Agron. For., Gouv. Gén. Indochine 1939: Pp. 259. 59 figs. Plates.

Faced with the necessity for producing a large bulk of seed of improved strains, the author turned to refined methods of mass selection, pedigree selection being too slow for the purpose. He paid particular attention to the association of characters and has developed statistical methods. In this way he produced the maize variety No. 52 in three generations of selection. In *Ricinus*, starting from a mixture of types including many hybrids, he obtained, again in three generations, populations 95 to 99% pure; he was able to make selections on seedlings in the cotyledon stage and also made a racial classification of the initial material.

With *Aleurites* a study of 800 trees was made, as a result of which four varieties of *A. montana* have been distinguished. Nine trees were used to form clones and from the seedlings raised from these, after selection in the nursery, small plantations have been planted, of about 100 trees each. These appear at present to be almost perfectly homogeneous but there will be an interval of 4 years before they can be tested.

TURNER, W. I. and

HENRY, V. M.

581.09

**Growing plants in nutrient solutions or scientifically controlled growth.**

John Wiley and Sons, Inc. New York 1939: 18s. 0d. Pp. xiii + 154. 29 figs. 3 pls. (Chapman and Hall, Limited, London).

Though the growing of plants on a commercial scale in the absence of soil attracted some interest in the popular press in its early stages of development in the U.S.A., the tendency of "experts" in other countries, or at least in England, has been to dismiss it as a "stunt". This is probably due to the extravagant claims which appeared in the newspapers and possibly to the fact that there appeared to be essentially nothing new in the method, which has of course been used by plant physiologists and others for many years for experimental purposes. The sober and practical account of the method given in this book, however, should do much to shake this rather complacent attitude.

Though claiming, not without justification, to have something of interest for amateurs, commercial growers and research workers, the book is likely to be most valuable to the commercial grower who wishes to take up soilless cultivation of plants on a fairly large scale.

The chapters deal respectively with a general view of nutrient culture, its commercial advantages, conversion of greenhouses from soil to nutrient culture, small-scale equipment, the chemistry and mathematics of nutrient solutions, sources and quantities of salts used, nutrient solution formulae, plant physiology, essential elements, testing nutrient solutions, diagnosing deficiency symptoms and general cultural conditions. Addenda give sources (American) of equipment and materials, a bibliography, specimen record sheets and an index and glossary combined. There are diagrammatic, photographic and coloured plates.

J. L. F.

FEILDEN, G. ST. C.

581.165:633

**Vegetative propagation of tropical and sub-tropical plantation crops.**

Tech. Commun. Bur. Hort. Plant. Crops, East Malling, Kent 1940: No. 13: 3s. 6d. Pp. 99. 3 figs.

The breeder of most plantation crops is dependent upon some method of vegetative propagation for the multiplication of his selected types and this bulletin will be found to be a very useful compilation of current knowledge of such methods as applied to a wide range of tropical and sub-tropical crops. The various techniques of vegetative propagation are first explained and illustrated with very clear line drawings. Then follows the treatment of individual crops, which are arranged in alphabetical order of their botanical names and each followed by a separate bibliography. The whole forms a most valuable text for reference purposes.

This bulletin may be regarded as a second edition of Technical Communication No. 7 of the Imperial Bureau of Fruit Production, with the range of crops dealt with extended from tropical and sub-tropical fruits to the whole range of plantation crops.

63(410+41.7)  
575:633(410+41.7)

**Agriculture in the twentieth century. Essays on research, practice, and organization presented to Sir Daniel Hall.**

Clarendon Press, Oxford 1939: 15s. 0d. Pp. x + 440. 3 figs.

This book, as the title suggests, takes the form of a series of essays dealing with the more important developments in agricultural research in Britain and in the organization and practice of British agriculture in the twentieth century. Practically every aspect is dealt with, each by an acknowledged authority.

The essay on plant breeding is written by H. Hunter, Director of the Plant Breeding Institute, Cambridge, and forms an excellent review of scientific plant breeding in the British Isles since its inception. It starts with an account of the work of the early breeders and of the advances in genetical theory made in the first few years of the present century. After this comes a detailed historical review of subsequent breeding work on wheat, barley, oats, flax, forage grasses and potatoes, and the essay ends with a glance into the future, particular reference being made to the part that will probably be played in plant breeding by distant hybridization and the artificial production of polyploids.

Other essays that will be of particular interest to plant breeders are: "Grassland" by R. G. Stapledon, "Outlines of the history of plant virus research" by R. N. Salaman, "Plant protection" by J. C. F. Fryer and "Landmarks in the development of scientific fruit-growing" by R. G. Hatton.

This book is one which every British agricultural scientist should have on his shelves and one which will also be of widespread interest elsewhere. It will be of permanent value as a record of the achievements of the past 40 years, years which have witnessed a revolution in so many aspects of agricultural practice or organization.

SMITH, K. M.

632.8

**The virus. Life's enemy.**

University Press, Cambridge 1940: 7s. 6d. Pp. viii + 176. 19 figs.

The third book in the series entitled "The Cambridge Library of Modern Science" is this book on viruses in which Dr. Kenneth Smith turns from his widely known research work on viruses to explain the subject to the layman.

The book is divided into two parts, the first on "the nature of the virus", dealing with the discovery, methods of study and material nature of viruses, and the second part on "the virus in action", describing methods of infection, viruses in relation to their insect vectors and to the cells of their host, important virus diseases and finally their prevention and control. An appendix contains a list of important virus diseases and there is a brief index.

Virus research is in many ways one of the most interesting fields in modern biology and a popular account by such a well known authority should be widely read. J. L. F.

633:551.566.1:016

**Bibliographie d'agriculture tropicale 1938. (Bibliography of tropical agriculture 1938).**

Int. Inst. Agric., Rome 1939: 15 Lire. Pp. vii + 466.

In the introduction to the eighth volume of this excellent series of classified bibliographies, already reviewed (cf. "Plant Breeding Abstracts", Vol. IX, p. 255), it is stated that annual reports of Experiment Stations and of some Departments of Agriculture have been intentionally omitted as these reports deal chiefly with administrative questions and experiments in progress and, although new and unpublished data are often given, these are somewhat difficult to isolate. It is suggested that the Directors of these institutions, who have been kind enough to forward their annual reports to the Institute, might in future briefly mention, at the end of the reports, the principal new facts which they contain. The great value of authors' summaries in facilitating bibliographical compilation is emphasized and it is hoped "that this practice which is the rule in scientific journals published in English, will become general." Excellent indexes arranged by subject and author are provided as in the previous volumes.

\*BUKASOV, S. M. and  
NAUMOV, N. A. (Editors)  
(**Wart-resistant varieties of potato**).

633.491-2.412.5-1.521.6:575.127.2  
633.491-1.524:582(8)

Sel'khozgiz, Moscow 1938: 8 roubles 40 copecks. Pp. 202. 9 figs. 45 tables.

The fungus, *Synchytrium endobioticum*, its history and biology are described. The various types of resistance and the nature of immunity are discussed, followed by methods of testing and genetical studies on resistance, the results of which are summarized in descriptive and tabular form. The production of resistant varieties is traced from the first observations of Daine, published in 1908, up to the present time, attention being called to the absence still of good wart-resistant early forms.

Among the South American potatoes wart resistance has been found in the following wild species:—*S. Jamesii*, *S. Commersonii*, *S. Antipoviczii* v. *Martinezii*, *S. ajuscoense* and *S. aracc papa* f. *brachikalukon*, *S. cathartrum*, *S. Molinae* and *S. leptostigma*. Some forms of *S. demissum* have proved resistant, others susceptible. *S. edinense* has also proved resistant and *S. palustre* possibly so. Brief descriptions of these wild species are given, including data on their photoperiodic reaction, starch and protein content. The highest yields in short day were obtained from *S. leptostigma*, *S. Molinae*, *S. ajuscoense* and *S. cathartrum* among the wild species and *S. tenuifilamentum* and *S. mamilliferum* among the primitive cultivated species.

Among the primitive cultivated species resistance has been observed in *S. stenotomum* v. *phiniu* f. *parvioculosum*, *S. ajanhuiri* f. *coloratum*, *S. ajanhuiri* f. *viride*, *S. tenuifilamentum* and *S. mamilliferum* f. *violacirubrum*. These species are also briefly described.

A great many wart resistant forms have also been found in *S. andigenum* and among the Chilean samples of *S. tuberosum*.

Certain *S. demissum* hybrids have shown themselves to be wart-resistant, e.g. hybrids with *S. andigenum* var. *quechuanum* and with the domestic variety Znicz; all the other hybrids tested were susceptible. Resistance has been observed in a hybrid *S. acaule* x *S. Rybinii*; in various triple hybrids obtained by crossing *S. goniocalyx* x *S. Bukasovii* with other species such as *S. Rybinii*, *S. phureja*, *S. ajanhuiri* and with Wohltmann; in hybrids of the susceptible species *S. curtilobum* with Deodara, Świtez and Centifolia, all susceptible varieties, and with various wart-resistant domestic varieties; in hybrids of *S. andigenum* var. *colombianum* f. *tocanum* crossed with Epicure, Centifolia and the resistant variety Jubel; f. *caiceda* x Centifolia; var. *quechuanum* x Centifolia and Weisse Riesen; f. *pacus* x Epicure, Giesevis, Weisse Riesen and Świtez; var. *cuzcoense* x Centifolia; var. *Herreae* x Centifolia and Jubel; f. *cocompis* x Centifolia; var. *bolivianum* x Centifolia; and var. *longibaccatum* x Cobbler.

A comprehensive list is given of existing wart-resistant varieties, with indications of their origin and of sources of further information and a brief description of each variety in turn. Data are given on the yields of a number of resistant varieties tested in various regions of the Soviet Union.

A supplement gives in tabular form the main characteristics of the South American species as regards yield, tuber characters, starch content and wart resistance and the monograph ends with a rather comprehensive bibliography.

634.63

L'olivier dans le monde. Superficie—Production—Commerce de ses produits.  
(**The olive tree throughout the world—Area—Production—Trade in its products**).

Inst. Int. Agric., Rome 1939: 25 lire. Pp. 246. Tables. 19 maps. (Sér. Monogr. Princip. Prod. Agric. Marché Mondial No. 6).

This monograph, which is one of a series on the principal agricultural products in the world markets, deals mainly from the economic standpoint with olive cultivation and production in the various countries of the Old and New World. In an introduction the origin of the olive, its vegetative cycle, productivity, climatic and soil requirements and area of cultivation in various regions are reviewed and the commercial aspects of olive production and the export and import trade are discussed with tabulated statistical data.

A bibliography (containing references up to 1939 as well as older works on the subject) and 19 statistical maps, showing areas of cultivation or oil production, complete the monograph.

\* A translation of the section describing the characteristics of the native wild and cultivated species of South America is available at the Bureau.

# INDEX

- Afzal, M., see Mohammad Afzal  
Almeida, J. M. de, 729  
Alpat'ev, A. V., 900  
Amin, K. C., 626  
Angremond, A. d', 849  
Anonymous, 586, 599, 605-6, 621, 630, 637, 644, 653, 664, 671-2, 679, 716-8, 752-4, 782, 805, 811, 848, 860, 869, 907, 915, p. 248, p. 253, p. 254.  
[Anson, R. R.], 621  
Araratian, A. G., 898  
Araratjan, see Araratian  
Archimovitch, see Arkhimovich  
Arkhimovič, see Arkhimovich  
Arkhimovich, A., 809  
Arkin, H., p. 248  
Arnautov, V. V., 784  
Ashby, M., 649  
Atwood, S. S., 676  
Austin, L., 879  
B....., A. F., 637  
Babcock, E. B., 730  
Bachtadze, see Bakhtadze  
Bailey, C. H., 744  
Bailey, L. H., 893  
Bakhtadze, K. E., 833  
Baldrati, I., 772  
Ball, R. S., 585  
[Bamtefa, A. O.], 621  
Bangham, W. N., 849  
Barabanov, P. N., 789  
Barducci, T. B., see Boza B., T.  
Barrett, C., 867  
Barrons, K. C., 910  
Barua, P. K., 641  
Baten, W. D., 665  
Beasley, J. O., 795  
Beckmann, I., 726  
Belovitskaya, see Belovitsskaya  
Belovitsskaya, N. A., 802  
Berg, S. O., 724  
Bergstrom, I., 882  
Bernardini, L., 828  
Bhola Nath, 624  
Binkley, A. M., 888  
Boas, F., 704  
Bohn, G. W., 903  
Bojarskii, see Boyarsky  
Bolhuis, G. G., 865, 916  
Bolsounov, see Bolsunov  
Bolsunov, I., [811], 827  
Bondar, G., 866  
Bonnier, G., 683  
[Boortzev, G. A.], 811  
Bose, S. S., 632  
Bougy, E., 808  
[Bowmaker, P. A.], 621  
Boyarsky, Y., 822  
Boza B., T., 625  
Brandes, E. W., 638  
Breakwell, E. J., 600  
Bregman, A., 841  
Breviglieri, N., 894  
Briggs, F. N., 763  
Bukasov, S. M., p. 254  
Burtsev, Ju. A., see Boortzev, G. A.  
Byrom, M. H., 797  
Calder, R. A., 659  
Carson, G. P., 613  
Caruso, C., 829  
Carvalho e Vasconcellos, J. de, see Vasconcellos, J. de Carvalho e  
Chamberlain, E. E., 663  
Chevalier, A., 787, 835  
Christoff, M., 813  
Churchward, J. G., 610  
Ciferri, R., 721-2, 738, 772  
Clark, A. G., p. 250  
Clark, C. F., 786  
Cochran, W. G., 598  
Coit, J. E., 868  
Coleman, O. H., 614  
Colenbrander, G. H., 848  
Colton, R. R., p. 248  
Copertini, S., 765  
Copper, R. R., 757  
Corns, J. B., 891  
Costa e Sousa, L. de Oliveira  
    Mendes da, see Sousa, L. de  
    Oliveira Mendes da Costa e  
Courtine, J., 735  
Cowden, D. J., p. 249  
Crane, M. B., 651  
Croxtan, F. E., p. 249  
Curteis, W. M., 602  
D....., L. R., 639  
Dahlberg, G., p. 249  
Dahms, R. G., 769  
Dillewijn, C., van, 636  
Dimitz, L., 720  
Down, E. E., 751  
Drahorad, F., 720  
Drewes, H., 895  
Dsubenko, see Dzubenko  
Ducker, H. C.], 621  
Durand, J.-F., 703  
Dzubenko, see Dzubenko  
Dzubenko, L., 819  
Elladi, K. V., 800  
Ellerton, S., 604  
Emme, H., 783  
Engelbeen, M., 791  
Evans, G., 645  
[Eyre, J. C.], 621  
Fatalizade, F. A., 817  
Feilden, G. St. C., p. 252  
Fernando, M., 661  
Ferrand, M., 847  
[Fielding, W. L.], 621  
Fischer, A., 775  
Fouarge, J., 881  
Frankel, O. H., 612  
Fransen, J. J., 714  
Funchess, M. J., 674  
[Galeev, G. S.], 713  
Garrett, S. D., 596  
Gavaudan, N., 697, 703  
Gavaudan, P., 697, 703  
Gavris', V. P., 887  
Gelin, O., 748  
Genčev, see Gentcheff  
Gentcheff, G., 681  
Georgi, C. D. V., 595  
Gerasimova, see Gerassimova  
Gerassimova, H., 700  
[Gešele, E. E.], 713  
Ghose, R. L. M., 624  
Giglioli, G. R., 721  
Gistl, R., 704  
Góis, L. A. de Almeida, 712  
Golubinskaja, see Holubinskaja  
Golubinski, see Holubinsky  
Gondô, A., 807  
Granhall, I., 799  
Grebennikov, P. E., 732  
Grechukhin, E. I., 802  
Grečukhin, see Grechukhin  
Greeves-Carpenter, C. F., 863  
Greis, H., 764  
Grjuner, see Grüner  
Grüner, M. N., 855  
Guseva, see Gusseva  
Gusseva, A., 695-6  
Gustafsson, Å., 681  
H....., A., 669.  
H....., A. G., 631  
Hagedoorn, 675  
Hall, C. J. J., van, 644  
Hand, D. B., 761  
Harlan, J. D., 838  
Harland, S. C., 627  
Harrington, J. B., 608-9  
Havas, L. J., 694  
Heeger, E. F., 837  
Heierle, E., 812  
Heinisch, O., 715  
Henry, V. M., p. 252  
Heyne, E. G., 762  
Hoedt, T. G. E., 719  
Hoffman, I. C., 899  
Hoffmann, W., 803  
Hofmeyr, J. D. J., 654  
Holubinskaja, N. I., 839  
Holubinsky, I. N., 839-40  
Honig, F., 843  
Hopkins, R. H., 591  
Hopkins, T. T., 919  
Houghtaling, H. B., 901  
Howard, H. W., 658  
[Hoyle, S. T.], 621  
Huelsen, W. A., 912  
Humphrey, L. M., 793  
Hussainy, S. A., 617  
Hutchinson, J. B., [621], 622, 624  
Hutton, E. M., 600  
Jagoe, R. B., 616  
[Jameson, J. D.], 621  
Janaki-Ammal, E. K., 635  
Jaretzky, R., 906  
Jenkins, J. M., 770  
Jenkins, J. M. (jun.), 889  
Johnson, J., 830-1  
Johnson, T., 592, 742  
Jones, D. L., 797  
Kachidze, see Kakhidze  
Kadam, B. S., 767  
Kajitch, M., 823  
Kakhidze, N. T., 733  
Kaspar'jan, see Kasparyan  
Kasparyan, A. S., 731, 796  
Kaznowski, L., 810  
Kerr, H. W., 633

- Khan, M. A., 584  
 Khanna, K. L., 632  
 Kihara, H., 745  
 Killough, D. T., 797  
 [King, H. E.], 621  
 [King, J. G. M.], 621  
 Knapp, E., 803  
 [Knight, R. L.], 621  
 Knjaginichev, M. I., 706  
 Knowles, P. F., 608-9  
 Knyaginichev, see Knjaginichev  
 Kondo, J. N., 877  
 Kondrat'eva, M. N., 871  
 Kostoff, D., 590, 702, 820, 832  
 Kotval, J. P., 650  
 Kovalev, N. V., 851, 857  
 Kovarskii, A. E., 913  
 Kozhuhov, I. V., 759  
 Kožukhov, see Kozhuhov  
 Krebčenko, L. E., 897  
 Kuhn, E., 705  
 Kulkarni, R. K., 767  
 Kumar, L. S. S., 648
- Lamb, C. A., 725  
 Lamb, J., 642  
 Lambers, M. Hille Ris, 836  
 Lamprecht, H., 670, 909  
 Langlet, O., 886  
 Larroque, P., p. 252  
 Laude, H. H., 762  
 Laustsen, O., 711  
 Lawrence, W. J. C., 587  
 Leiper, R. T., 620  
 Leonard, W. H., p. 250  
 Lesley, J. W., 859  
 Lewcock, H. K., 656  
 Lewis, D., 651  
 Li-Ying Shen, 737  
 [Lochrie, J. V.], 621  
 Lombard, P. M., 786  
 Loo, W. S., 698
- McCalla, A. G., 611  
 [MacDonald, D.], 621  
 Macindoe, S. L., 603  
 McIntosh, A. E. S., 634  
 McIntosh, T., 619  
 [McKinstry, A. H.], 621  
 Madoo, R. M., 625  
 Mahalanobis, P. C., 632  
 Maier, J., 853  
 Malik Amanat Khan, see Khan, M. A.  
 Mangelsdorf, P. C., 760  
 [Manning, H. L.], 621  
 Mansvetov, V. I., 856  
 Mar'janović, see Maryanovich  
 Martin, J. H., 769  
 Maryanovich, O., 818  
 Mather, K., 589  
 Matveeva, E., 870  
 Matz, J., 638  
 [Mayo, J. K.], 621  
 Mayr, E., 736, 766  
 Medvedeva, see Medwedewa  
 Medwedewa, G. B., 806  
 Meijere, J. C. H. de, 686  
 Mellor, D. H. S., 600  
 Mendiola, N. B., 862  
 Midusima, U., 771  
 Miège, E., 735, 779  
 Miège, J., 774
- Milan, A., 741  
 [Miller, W. L.], 621  
 Minkevič, I. A., 845  
 Mitchell, R. S., 593  
 Modilevskii, see Modilewski  
 Modilewski, J., 819, 824, 826  
 Mohammad Afzal, 623  
 Mudra, A., 699, 723, 801  
 Munroe, J. W., 621  
 Müntzing, A., 773
- Nath, B., see Bhola Nath  
 Naumov, N. A., 713, p. 254  
 Navarro, A. F., 875  
 Navaschin, see Navashin  
 Navashin, M. S., 700  
 Nawaschin, see Navashin  
 Near, R., 854  
 Negrul, A. M., 877  
 Newcombe, H. B., 794  
 Newton, M., 592, 742  
 Nilsson-Ehle, H., 878, 883-4  
 Nizenkov, N. P., 710  
 Noachovitch, G., 873  
 Noguti, Y., 825  
 Nowell, W., 621  
 [Nye, G. W.], 621
- Oescu, C. V., 749  
 Ogden, W. B., 830-1  
 Oka, H., 825  
 Okuma, K., 825  
 Olson, P. J., 755  
 Olsson, P. A., 781  
 Oraman, N., 876  
 Osmanov, V. O., 852  
 Ostanin, S. N., 785
- Pal, B. P., 647  
 Palmova, E., 728  
 Pan, C. L., 743  
 Park, M., 661  
 Patel, N. M., 648  
 Patel, S. M., 767  
 Pathak, G. N., 607  
 [Peat, J. E.], 621  
 Peeling, B. A., 790, 905  
 Pellew, C., 662  
 Perucci, E., 816  
 [Peters, R. W.], 621  
 Peterson, R. F., 742  
 Pierantoni, U., p. 251  
 Pierce, W. H., 677  
 Pincus, J. W., 668  
 Pittery, R., 791  
 Piunowsky, I. M., 789  
 Pjatinitskii, S. S., 880  
 Poggendorff, W. H., 615  
 Poljanskii, see Poljanskij  
 Poljanskij, V. I., 687  
 Popesco, C., 908  
 Popova, G. M., 842  
 Posnette, A. F., 646  
 [Prentice, A. N.], 621  
 Price, J. R., 587  
 Pridham, J. T., 602  
 [Psareva, E. N.], 811  
 Pukhal'skii, A. V., 709  
 Pukhalsky, see Pukhal'skii
- Quinby, J. R., 768
- Ramanujam, S., 618, 647
- Randolph, L. F., 761  
 Ranganatha Rao, V. N., 629  
 Rao, V. N. Ranganatha, see Ranganatha Rao, V. N.  
 Raptopoulos, T., 652  
 Raw, A. R., 601  
 Reeves, R. G., 760  
 Reimers, F. E., 896  
 Richharia, R. H., 650  
 Robertson, D. W., 614  
 [Rose, M. F.], 621  
 Rožkov, M. I., 858  
 [Rusakov, L. F.], 713  
 [Ruston, D. F.], 621  
 Rzaev, M. M., 792
- Salamov, A. B., 756  
 Salmon, S. C., 666  
 Saltykovskij, see Saltykovsky  
 Saltykovsky, A. I., 746  
 Saltykovsky, M. I., 740  
 Salvo, C., 890  
 Sansome, F. W., 597  
 Saprygina, see Sapryguina  
 Sapryguina, E. S., 740  
 [Sarana, M. O.], 811  
 Šardakov, see Shardakov  
 Sarup Singh, 623  
 Sató, D., 689  
 Savelli, R., 829  
 Sawin, J. L., 919  
 Schenk, G., 906  
 Schlumberger, 788  
 Schmuck, see Shmuck  
 Schwanitz, F., 692  
 Schweizer, J., 814  
 Scott, G. W., 677  
 Scott-Moncrieff, R., 682  
 Selivanova, A. N., 900  
 Sengbusch, R. von, 778  
 Ševčuk, T. N., 739  
 Shardakov, V. S., 707  
 Shen, L.-Y., see Li-Ying Shen  
 Sheppard, W. F., p. 250  
 Shmuck, A., 695-6  
 Sidky, A. R., 684  
 Silant'ev, I. G., 678  
 [Silow, R. A.], 621  
 Simmonds, J. H., 593  
 Singh, R., 744  
 Singh, S., see Sarup Singh  
 Singleton, W. R., 758  
 Sinke, N., 691  
 Sinskaja, E., 687  
 Sirks, M. J., 688  
 Smith, H. P., 797  
 Smith, K. M., p. 253  
 Šmuk, see Shmuck  
 Snyder, L. H., p. 251  
 Sokol'skii, D. P., 727  
 Solly, N., 643  
 Sosnin, S. V., 852  
 Sousa, L. de Oliveira Mendes da Costa e, 874  
 Srinivasachar, D., 655  
 Stebbins, G. L. (jun.), 660  
 [Stenhouse, A. S.], 621  
 Stepanov, P. A., 850  
 Stephens, J. C., 768  
 Stephens, S. G. [621], 628  
 Stino, K. R., 815  
 Stoffels, A., 667  
 Stoletova, E. A., 747

- Straub, J., 693  
 Stubbe, H., 685  
 Sveshnikova, I. N., 776  
 Svešnikova, see Sveshnikova  
 Sylvén, N., 878  
 [Syrovatskii, S. G.], 713  
  
 Tang, P. S., 698  
 Tatarintsev, A. S., 678  
 Tatarinzev, see Tatarintsev  
 Teik, G. L., 595  
 Temple, C. E., 872  
 Terao, H., 771  
 Ternovskii, see Ternovsky  
 Ternovskij, see Ternovsky  
 [Ternovsky, M. F.], 811  
 Thayer, J. W., 751  
 Thorpe, H. C., 594  
 Tiflova, A. M., 804  
 Tobyáš, J., 798  
 Torrie, J. H., 750  
 [Tothill, J. D.], 621  
 Trail, F., 918  
 Tros'ko, I. K., 864  
  
 Trotter, A., 821  
 Tubbs, F. R., 640  
 Tucker, C. M., 903  
 Turner, W. I., p. 252  
  
 Ufer, M., 777  
 Undenäs, S., 748  
  
 Vakulin, D. J., 844  
 Vasconcellos, J. de Carvalho e,  
     875  
 [Vavilov, N. I.], 713  
 Vears, C. K., 602  
 Virgin, W. J., 904  
 Vogel, O. A., 734  
 Voss, J., 780  
 Vydrin, V. I., 846  
  
 Waddington, C. H., 588  
 Wade, B. L., 911  
 Wahlen, F. T., 673  
 Webber, H. J., 861  
 Weidman, R. H., 885  
 Weimer, J. L., 920  
  
 Weischsel, G., 701  
 Wellensiek, S. J., 834  
 Wenzholz, H., 602  
 Whiteman, E. F., 786  
 [Wight, N. M.], 621  
 Wight, W., 641  
 Winge, Ö., 711  
 Winkler, H., 708  
 Winter, F. L., 677  
 Wulff, H. D., 690  
  
 York, H. A., 914  
 Young, H. E., 657  
 Young, P. A., 902  
  
 Zagorodskikh, P., 892  
 Zaumeyer, W. J., 911  
 Zayas y Muñoz, F. de, 680.  
 Žebrak, see Zhebrak  
 Zhebrak, A. R., 792  
 Žogolev, A. M., 917  
 [Zolotnitskii, V. A.], 713  
 Zubarev, A. K., 713  
 [Žukov, N. I.], 811



**THE IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS,**  
**School of Agriculture, Cambridge, England.**

*Director:* PROF. F. L. ENGLENDOW, M.A., Drapers' Professor of Agriculture.

*Deputy Director:* P. S. HUDSON, Ph.D.

*Assistants:*

MRS. R. M. INGHAM, M.Sc.

MISS M. L. C. WILSON, B.A.

S. ELLERTON, Ph.D.

*Secretary:* MISS K. M. STEARN.

**Publications:**

**PLANT BREEDING ABSTRACTS.**

Issued quarterly. Subscription 25/-, with Subject Index 27/6. (Subscriptions sent direct from within the British Commonwealth of Nations are subject to a reduction of 5/-.) Single copies 7/6 each. Drafts should be made out in sterling currency.

A few back numbers of Vol. V onwards are obtainable at 35/- per volume, single numbers 10/- each.

Copies of "Plant Breeding Abstracts" printed on one side of the paper can be supplied, for the convenience of readers wishing to cut up and file the references, at an additional cost of 5/- per volume.

**Important Note.**—Every effort is made to make Plant Breeding Abstracts as complete as possible and its notices of papers referring to plant breeding or the genetics of crop plants as prompt as possible. To aid in this, authors are invited to send to the Deputy Director copies of their papers immediately on publication.

**Other Publications:**

INDEXES	s. d.	BIBLIOGRAPHICAL MONOGRAPHS	s. d.
Subject Index to Vols I to V of Plant Breeding Abstracts .. .. .	2 6	Breeding Varieties Resistant to Disease	2 0
Subject Index to Vols VI to VIII of Plant Breeding Abstracts .. .. .	2 6	Breeding Resistant Varieties, 1930-33 (Supplement) .. .. .	2 0
Subject Index to Vol. IX of Plant Breeding Abstracts .. .. .	2 6	Oat Breeding Bibliography .. .. .	1 6
SUPPLEMENTS TO PLANT BREEDING ABSTRACTS		Rice Breeding Bibliography .. .. .	1 6
Summary of Reports received from Countries exclusive of the British Empire, 1928-31. Supplement I. .. .. .	2 6	Bibliography on Interspecific and Inter-generic Hybridization in Relation to Plant Breeding .. .. .	2 0
Summary of Reports received from Stations in the British Empire, 1932-35. Supplement II .. .. .	2 6	Account of Research in Progress in the British Empire .. .. .	3 6
TECHNICAL COMMUNICATIONS		Rye Breeding Bibliography .. .. .	1 6
Vernalization and Phasic Development of Plants .. .. .	10 0	Bibliography on Breeding Sorghums and Millets .. .. .	1 0
An Outline of Cytological Technique for Plant Breeders .. .. .	1 6	The Experimental Production of Haploids and Polyploids .. .. .	2 6
The South American Potatoes and their Breeding Value .. .. .	3 6	Tobacco Breeding Bibliography .. .. .	1 0
The Action and Use of Colchicine in the Production of Polyploid Plants, by J. L. Fyfe .. .. .	1 0	Bibliography of Baking Quality Tests, Supplement .. .. .	1 6
Field Trials: their Lay-out and Statistical Analysis by John Wishart .. .. .	2 6	Bibliography on Cold Resistance .. .. .	1 6
Joint Publication No. 3. The Breeding of Herbage Plants in Scandinavia and Finland .. .. .	4 0		

Subscriptions to any of the above Publications should be sent to the Deputy Director, Imperial Bureau of Plant Breeding and Genetics, School of Agriculture, Cambridge, England.

**Loss in Transit.**—Claims for numbers of Plant Breeding Abstracts lost in transit will only be considered if notice of such loss is received within three months of the date of posting.

# IMPERIAL AGRICULTURAL BUREAUX

---

## IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS,

School of Agriculture,

Cambridge, England,

covers current literature on the breeding, genetics, and cytology of economic plants, including forage crops, fruits, and forest trees, and relevant publications in allied fields, such as applied statistics, plant pathology and other sciences.

For publications see inside cover.

---

## IMPERIAL BUREAU OF PASTURES AND FORAGE CROPS,

Aberystwyth, Great Britain,

covers current literature on grassland and forage crop research, the botanical aspect of soil conservation and certain plant biological research.

Publications: Herbage Abstracts, 25/- per annum,\* 7/- per quarter.

Herbage Reviews, 15/- per annum, 4/- per quarter.

---

## IMPERIAL BUREAU OF HORTICULTURE AND PLANTATION CROPS,

East Malling, Kent, England,

covers current literature on horticulture, including fruit, vegetables, commercial flower production, the cultivation of tropical plantation crops and the storage and processing of horticultural products.

Publication : Horticultural Abstracts, 25/- per volume,\* single copies 6/6.

---

## IMPERIAL FORESTRY BUREAU,

39, Museum Road,

Oxford, England,

covers current literature on all branches of forestry and issues a quarterly publication.

Publication : Forestry Abstracts, 25/- per annum,\* single copies 7/6.

---

## IMPERIAL BUREAU OF SOIL SCIENCE,

Rothamsted Experimental Station,

Harpenden, Herts.,

covers current literature on soil science, and issues an abstracting journal six times yearly.

Publication : Soils and Fertilizers, 25/- per annum.\*

\* These prices are subject to a reduction of 5/- per volume to subscribers within the British Commonwealth sending their subscriptions direct to the Bureau. Details on application to its Deputy Director, to whom subscriptions to its Abstracts Journal should be sent. Certain Bureaux publish special editions of their abstracts journals printed on one side of the paper only, for use in card indexes.